Consulting Engineer

July 1956

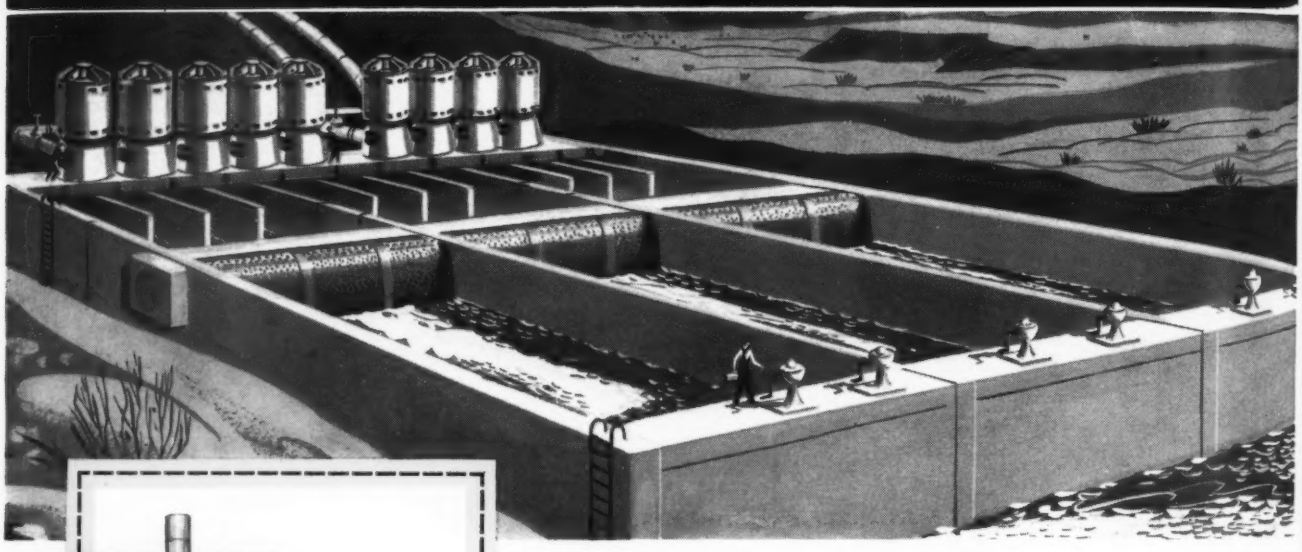
Si e Selection as a Science

B RAYMOND SAYER, as Manager of Plant Location Surveys in the Research Division of The Austin Company, Cleveland, Ohio, is an example of the increasingly important role of the younger engineer in consulting engineering firms. Sayer, a registered professional en ineer in Ohio and several other states, and a member of the American Society of Civil Er gineers, joined Austin in 1935 after studying engineering at the University of Michigan.

—Continued on page 6

The Consulting Engineer's Professional Magazine

Giant new Tidewater refinery selects Byron Jackson pumps for 400 MGD service



TWO STAGE BJ PUMP shown without discharge head and motor.

SPECIAL ENGINEERING REPORT AVAILABLE:

A special engineering report with detailed flow diagrams and color photographs is available. Also, a factual full-color motion picture report can be arranged on request.

Tidewater Oil Company's new Delaware Flying A Refinery is one of the world's largest new refineries. This giant refinery—15 miles south of Wilmington—will use more than 16 million gallons of water per hour. To accomplish this mammoth pumping job, Tidewater and C. F. Braun & Co. (engineers and constructors) selected nine BJ 2000 hp vertical river intake pumps, with provision for installation of three more units.

BJ Pre-Tested the Actual Installation

Because of the special intake system and the untested hydraulic problems involved, it was decided to pre-test the actual pumping conditions. A scale model intake installation—including nine pumps—was constructed in Byron Jackson's Los Angeles hydraulic laboratory. Actual field operations were duplicated in this model. All tests confirmed the correctness of engineering and pumping specifications. In addition, before delivery, Byron Jackson performed exacting hydraulic tests on each of the nine pumps. *These giant pumps tested to an 89.5% efficiency!*

Each BJ pump will be driven by a 2000 hp electric motor at 600 rpm against a total head of 184 feet. Because of the brackish salt water, pump cases, columns and impellers are made of high alloy stainless steel.

BJ

SINCE 1872

Byron Jackson Pumps, Inc.

A Subsidiary of Borg-Warner Corp.

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consulting engineer

July 1956

FEATURE ARTICLES

DEPARTMENTS

The Consulting Engineer's Professional Magazine

B. Raymond Sayer

—Starts on front cover

He moved up steadily from draftsman to design engineer, to office engineer on the Chicago Army Aircraft Assembly Plant project. In 1948 he was assigned to the Research Division to work on plant location surveys. Early this year Sayer was made manager of surveys.

The Austin Company first offered plant location as a regular service in 1938, after repeated requests by clients for advice in this field. While at that time the field was not new, most industries did the job themselves. But as industries grew in size and started to expand and decentralize at the same time, to take advantage of low transportation costs and population shifts, the problem of selecting the correct site became more complex.

As Sayer points out, "Many industrial firms now realize that they do not have either the necessary time or the trained personnel to conduct proper research into proposed sites to insure a safe result. The contemplated move may be a 'one time thing.' In such instances it is the first and only large move or expansion that plant personnel encounter. To pick the right site takes accumulated knowledge and experience. This is not the type of problem that can be solved by the simple expedient of looking up the answer in a book.

Factors to Consider

"The check list of questions to be considered includes many factors in addition to the obvious ones of availability of raw materials for the plant and ease and economy of shipping the finished product. For example, the first question to be answered is, 'why is it necessary to move or to build another plant?' Perhaps better plant layout would make the existing plant efficient enough to handle an expansion in business. More effective use of available transportation facilities might reduce costs to the point where a move would not be justified or necessary.

"Clients come to us with all types of location problems. Some have already decided on a site and want to have their own judgment backed up. For others we may be asked to make a study of the economics of the move, and when this is established, to make a complete plant location survey including choice of a site — and possibly acquisition of the property itself. If necessary, we work with the local zoning authorities and meet with interested local citizens to be sure the plant will be accepted in the community. This preparation saves headaches later on.

"The field of plant location is so broad and covers such a variety of skills that even here at The Austin Company, where we have an unusually diversified group of engineers, we sometimes engage consultants to handle certain aspects of a survey — such as when unusual soil conditions may exist. After all, one of the advantages that should accrue from use of a consulting firm is an outside viewpoint — based on engineering judgment, of course.

"All the men in the survey department are experienced engineers based at Cleveland, from which point this work is directed. Our district offices, however, assist in plant location work from time to time when it is in the client's interest.

Use of Yardsticks

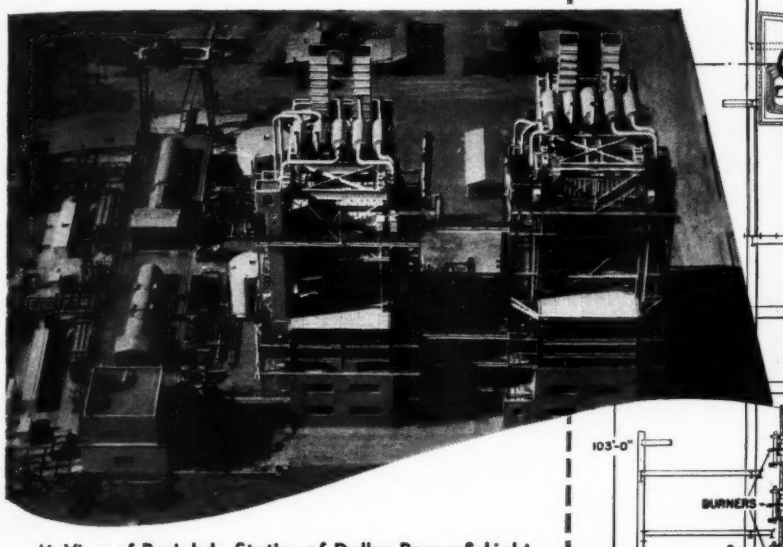
"We have developed yardsticks over a period of years with which we measure the suitability of a site. They include a check list of factors important to the particular industry, community attitudes, labor force, shipping facilities, utilities, taxes, and local regulations that affect the industry. After the investigation is complete, a written report is submitted to the client with several specific recommendations, listing three or more appropriate sites. The client is urged to visit each site listed and then decide which he feels is most desirable. In one instance the board of directors of a client company were so pleased with our first choice that they voted to approve it without looking at the second and third choice locations. At our urging they finally looked at the second site. The company is now the happy owner of a successful new plant at the second-choice site.

Giveaway Offers

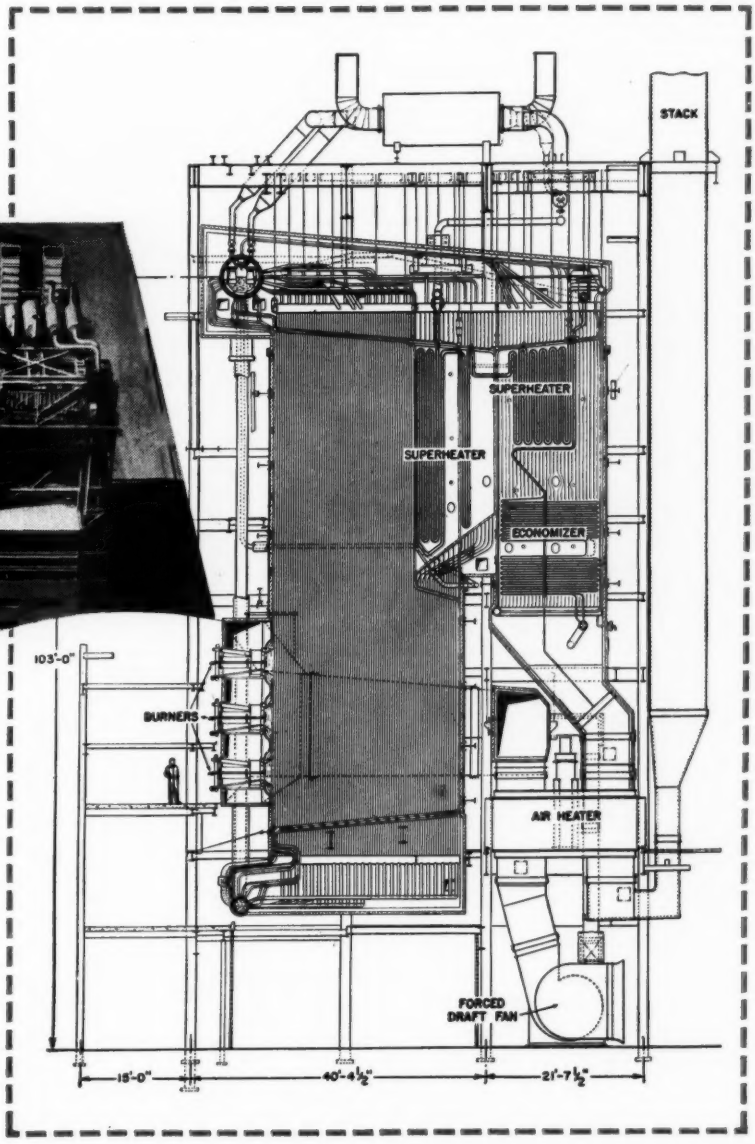
"We receive valuable data from railroads, utilities, and state agencies to apply against our yardsticks. However, we carefully scrutinize blandishments of 'something for nothing' that over zealous promoters of communities or areas offer companies in the form of free buildings, special tax benefits, and financing.

"We recognize the need for greater employment in depressed areas, but if a plant locates in such an area when it should have been located in another area for efficient operation, then the choice of the depressed area becomes unsound. It is neither in the best interests of the community nor of the company that located there.

"It is surprising that some companies do not realize that if they are in good enough financial shape to warrant expansion or the move to a new plant, financing on attractive terms can be obtained from many sources. If the area is really desirable for the industry, it need not offer special inducements, and if the industry is not acceptable by the banks as a good loan risk, the community shouldn't want it anyway. Furthermore, unless the industry assumes its share of burdens, such as taxes, then an unbalanced situation develops which places hard-



Air View of Parkdale Station of Dallas Power & Light Company. Consulting Engineers: Ebasco Services, Inc.



Modern Central Stations Serving America

Dallas Power & Light's PARKDALE STATION

Equipped with 3 B&W Boilers

Dallas Power & Light Company's current expansion program at Parkdale Station increases the Station's generating capability to 327,000 kw—to serve even better the mounting power needs of this important segment of the Great Southwest.

Of three B&W boilers at Parkdale Station, two are on the line and the third is under construction, scheduled to begin operation in 1957. Unit No. 1 serves 87,000 kw, Unit No. 2, 115,000 kw, and Unit No. 3, 125,000 kw.

The latest B&W unit chosen for Parkdale will provide 1,050,000 lb of steam per hour, with design pressure of 1725 psi, superheater outlet pressure of 1550 psi and temperature of 1005 F. This B&W Radiant Boiler has a pressurized furnace.

Parkdale is characteristic of the type of stations being built by electric companies in the Southwest; B&W is happy to share in this construction by providing technical advances gained through its continuing program of research and development—for increasingly efficient steam-electric power generation. The Babcock & Wilcox Co., Boiler Div., 161 East 42nd St., New York 17, N.Y.

G-764

BABCOCK & WILCOX

BOILER DIVISION

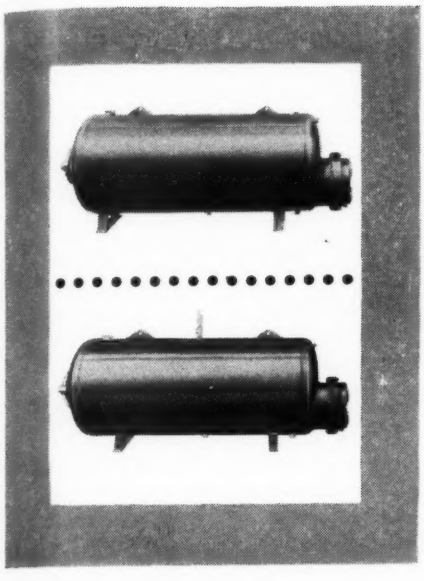
ships on other segments of the community that they should not be required to carry.

"I do not mean that communities should not make efforts to make themselves attractive to industry. I am sure you have seen the cartoon that shows a sign reading 'For sale, zoned for industry,' and under it another sign 'Danger! swampy area.' Every city and town of any size should have an efficient planning commission. Without such a group, industry frequently is considered a poor relation zoning-wise.

"The Austin Company does not accept assignments to make surveys of towns or areas for promotion purposes, since these jobs might tend to prejudice its judgment in plant location work. These communities are referred instead to such organizations as the National Industrial Zoning Committee and the Urban Land Institute, both non-profit organizations that publish material on what can and should be done to promote effective use of land.

"For instance, the Industrial Council of the Urban Land Institute, of which I am a member, offers two types of services — plan analysis and panel studies. Plan analysis, available only to sustaining members of ULI, is conducted as part of the twice yearly meetings of the Council. At these meetings, the member may present development plans for discussion by the Council. Subjects considered have varied from planning, zoning, and site layout problems, to setbacks for industrial plants, and parking provisions. Panel studies are available to private organizations and public agencies. The panel is made up of men considered authorities in the field under study. Panel members spend several days on the site inspecting the area, interviewing interested parties, and analyzing proposed solutions. A report is then submitted for discussion at a special meeting. These studies have covered subjects from industrial potentialities of a tract to analysis of economic problems and future industrial development of entire communities. I served on a panel last year, sponsored by the Detroit News, that discussed ways to revitalize Detroit's central business district.

"To remain healthy financially, a community needs industry to provide a broad tax base. The community is under obligation to have available suitable zones for industry. The consultant, then, has an obligation to its industrial client to choose the site that fulfills its requirements now and in the future." ▲▲

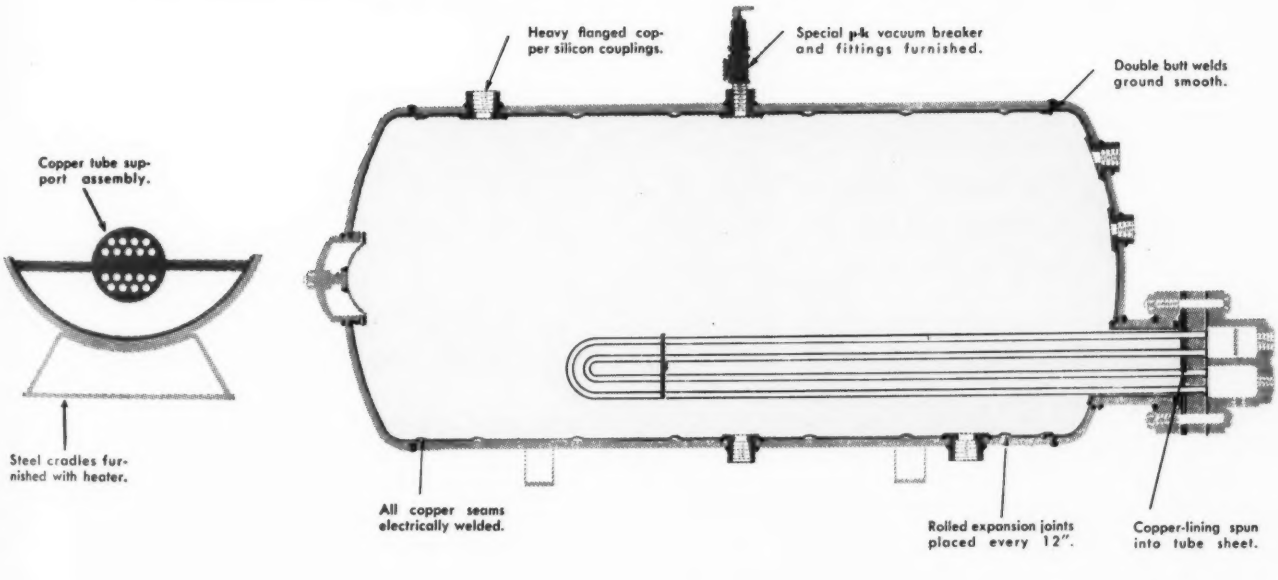


WHICH OF THESE

Copper-Lined HEATERS

WOULD YOU SPECIFY?

ONLY ONE has all these features



Like twins, copper-lined heaters can look pretty much alike—on the outside. But *inside*, and on key points of construction, they can be as different as day and night.

Engineers experienced in copper-lined heaters are aware of these vital differences and specify accordingly.

They insist, for instance, on rolled joints every 12 inches around the full circumference of the lining to allow for longitudinal expansion . . . on the copper-lining being not less than 3 lb. per square foot . . . on heavy flanged copper silicon couplings, welded to both the shell and the lining . . . on enough tube supports . . . on an adequately long tube bundle with parallel "U" bends . . . and on a vacuum breaker valve to protect the lining from sudden pressure fluctuation. They make sure that separate hydrostatic and pneumatic tests are run to guarantee that linings will be leakproof.

These experts specify these details, and others, found only in P-K heaters, because they know that heaters built *without* such safeguards are false economy; but that heaters "built right," like P-K's "Indestructo" copper-lined heaters, assure trouble-free service year after year.

Like the full story? We've detailed the key construction features in sample specifications and in P-K's new Catalog 19. Ask your local P-K representative for copies or write today.

The Patterson-Kelley Co., Inc., 1770 Burson Street, East Stroudsburg, Pa.

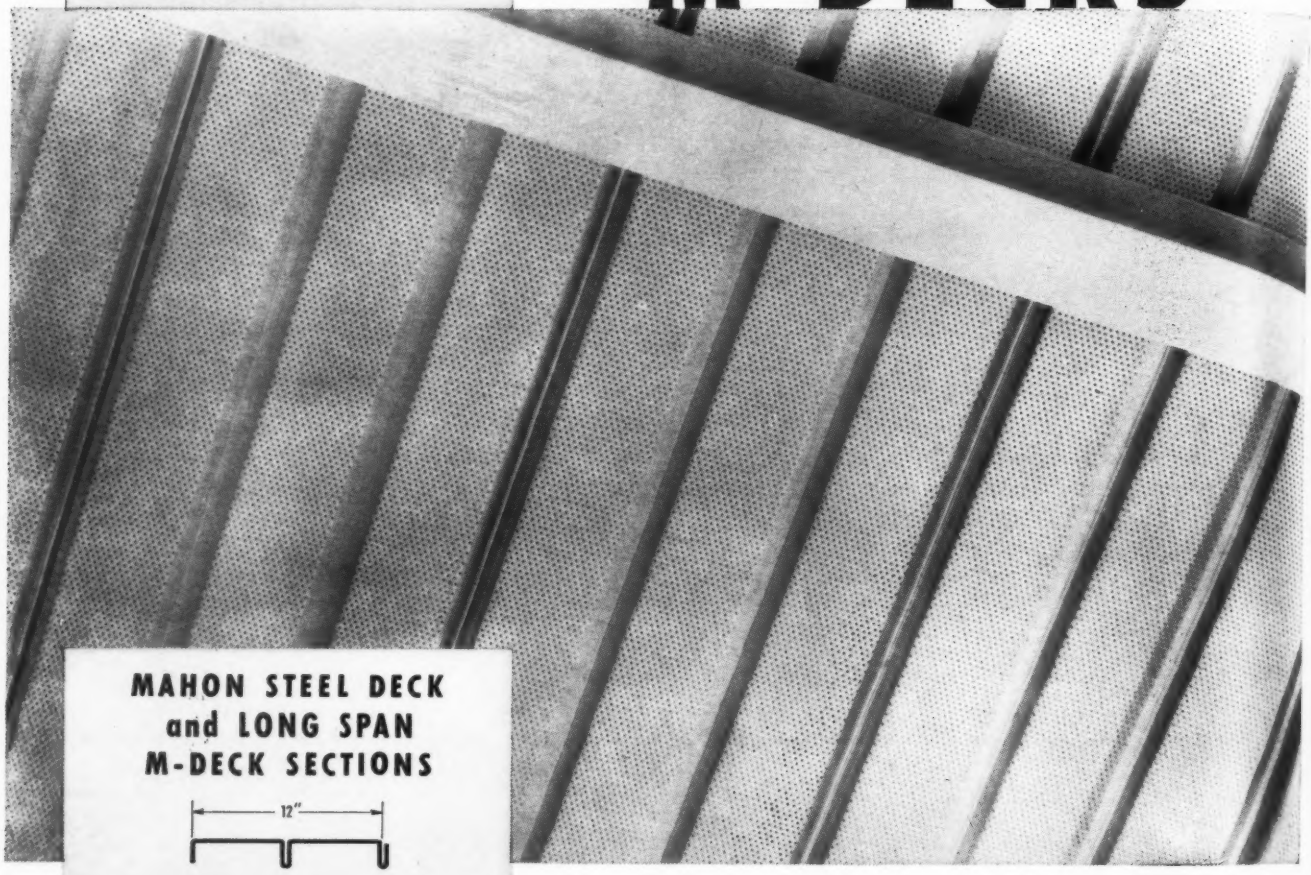
Patterson-Kelley

2598

storage water heaters • instantaneous heaters • convertors • fuel oil heaters • freon chillers and condensers

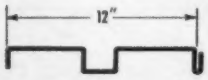
STEEL DECK and LONG SPAN M-DECKS

Mahon Long Span M-Deck, shown below, also provides the Acoustical Ceiling in the new Body Engineering Building, Ford Research and Engineering Center. Voorhees, Walker, Foley & Smith, Architects. Bryant & Detwiler Company, General Contractors.

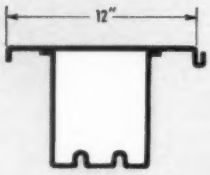


MAHON STEEL DECK and LONG SPAN M-DECK SECTIONS

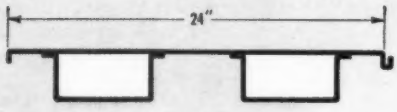
STANDARD DOUBLE RIB



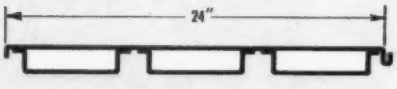
WIDE-FLANGE DOUBLE RIB



LONG SPAN M-DECK SECTION M1



LONG SPAN M-DECK SECTION M2



LONG SPAN M-DECK SECTION M3

Steel Deck is the most practical and most logical material for modern roof construction . . . it is most logical because it is lighter in weight, and because it costs less than any other type of permanent roof building material. And now that Long Span M-Decks are available in a number of structural sections that meet virtually any requirement in roof construction, as well as combined roof/ceiling construction, *STEEL*, employed as the structural unit and interior finish material as well, will roof even a broader range of building types. The illustration above shows a typical combination Long Span M-Deck Roof and Acoustical Ceiling —bottom metal of the Cel-Beams is perforated and sound absorbing material inserted to provide excellent acoustical properties. This same result can be obtained with a beamed ceiling effect, as shown, or with the Cel-Beam Section inverted, which produces a flat metal ceiling surface. Mahon Long Span M-Decks can be furnished in Cel-Beam Sections, Open Beam Sections, or Troffer Sections to span up to 32 feet. See Sweet's Files for information or write for Catalogs D-56 and M-56.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago • Representatives in Principal Cities

Manufacturers of Steel Roof Deck and Long Span M-Decks; M-Floors (Electrified Cel-Beam Floor Systems); Permanent Concrete Floor Forms; Insulated Metal Walls and Wall Panels; Rolling Steel Doors, Grilles and Underwriters' Labeled Automatic Rolling Steel Fire Doors and Fire Shutters.

MAHON

READERS' COMMENT

Pile Lengths from Soil Data

Sir:

We wish to comment on a statement made in your April issue in "News," "Steel H-Beam Pilings Safe for Skyscraper Foundations," page 76: "An interesting side result of these tests is evidence that further tests of this type may lead to determination of pile length solely from soil data."

The predetermination of pile lengths from soil data is not new, but has been common practice with several consulting firms for a period of many years. As an example, the firm of Dames & Moore has followed a procedure of predetermining pile lengths for more than 15 years . . .

On approximately 100 occasions, the predetermined pile capacities have been checked by means of pile load tests conducted in a manner similar to that used by the Armour Research Foundation. Where it has been possible to install strain gages in the piling, the measured load transfer between the piles and soil have shown rather good agreement with that predicted. . .

Don V. Roberts
Quality Improvement Engineer
Dames & Moore
Los Angeles, Calif.

Corporate Practice

Sir:

I was astonished at the simplicity of the solution to the problem of corporate practice of engineering as proposed by Senator Alfred L. McCawley in the May issue of CONSULTING ENGINEER. Those of us here in New York who have been working on this problem for three years feel like kicking ourselves for not thinking of it first.

Apparently all that is necessary now to implement the Senator's solution to the problem is the invention of the two words that he is looking for, where he says, "Here we can see the reason for some appropriate word other than 'practice' to express the activities of corporations that offer the services of registered engineers to the public—and some other word than 'registration' to designate the authority under which the corporations' engineering activities are carried on."

I would like to be the first to suggest a new transitive verb, "McCawley," to be synonymous with "registered" when applied to corporations.

I have had a little more trouble thinking of an appropriate new word meaning "to solicit, offer, and render engineering services to," as applied to corporations, and the best I have come up with is the word "booshwah," which was current in New York years ago, but has since passed into disuse. I think that at this critical juncture in our history it merits revival.

With these two words established in our lexicon we can proceed to write a model law for the corporate practice of engineering, beginning perhaps as follows:

"Upon payment of the customary fee of $2 a corporation may be McCawleyed to booshwash the public . . . etc."

What price semantics!

Samuel A. Bogen, Partner
Bogen & Alston
New York, N. Y.

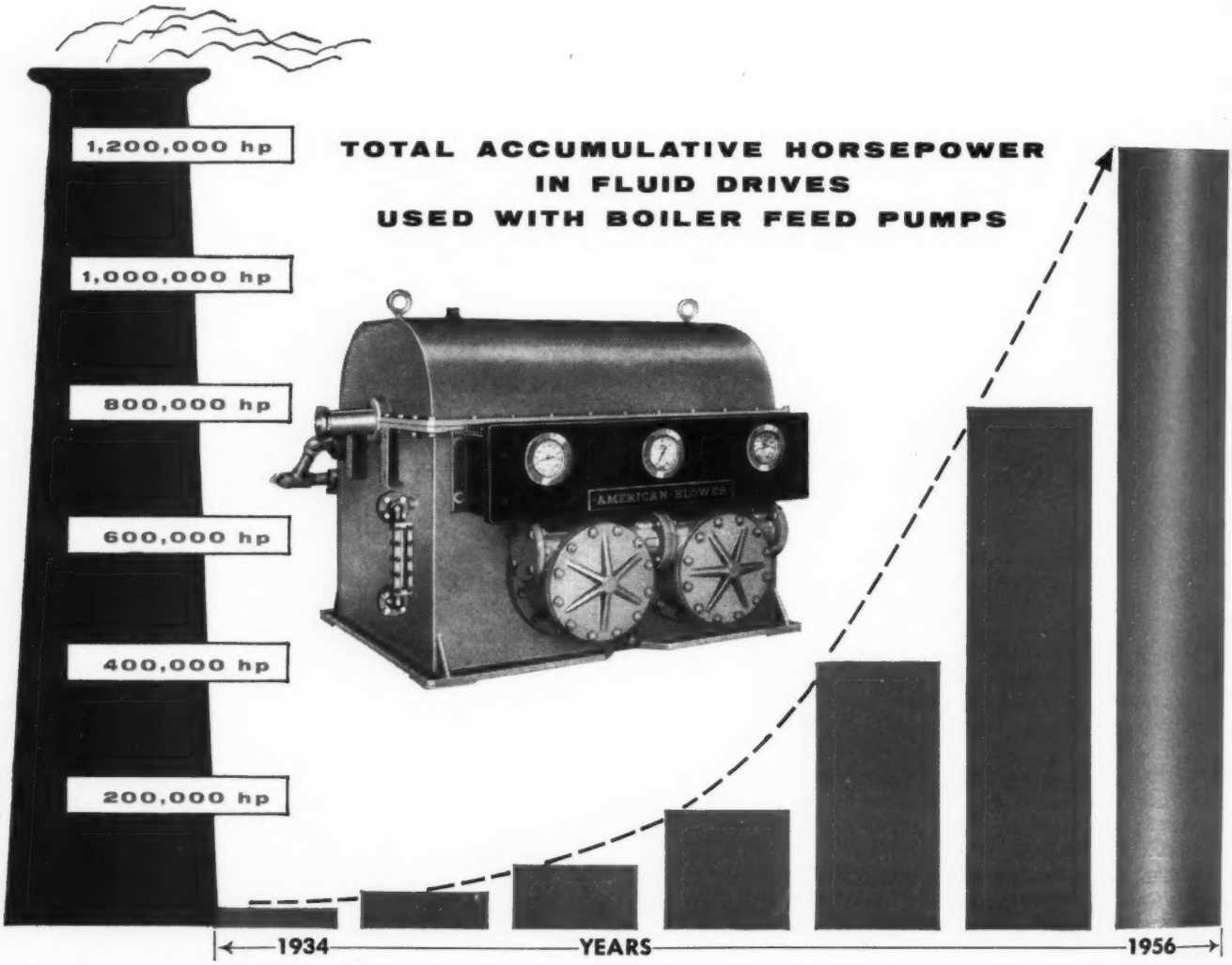
Sir:

I am in accord with the central theme of Senator McCawley's article on "The Corporate Practice of Engineering" (May CE, p. 46). I believe though . . . that it should not be accepted as the last word . . .

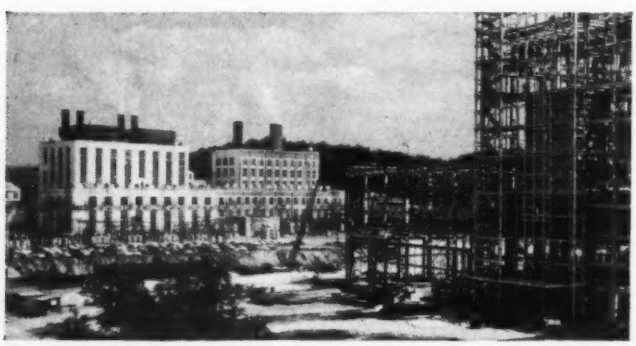
Senator McCawley said "Being liable for all damages incurred through negligence of its agents . . . a corporation would have neither inducement nor inclination to coerce

AMERICAN BLOWER REPORTS ON PROGRESS IN POWER

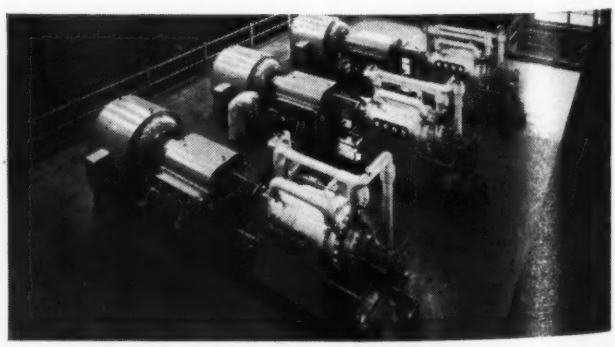
The big swing is to Gýrol® Fluid



Accelerated industry-wide acceptance. Beginning in the late 1930's, demands for higher pump pressures resulted in the high-speed boiler feed pump. Consulting and utility engineers turned to Fluid Drive because of power savings from adjustable-speed operation. As a result, new quick-response, close-control Fluid Drives were developed specifically for feed-pump service. Rapid acceptance is shown on graph above. By 1957 there will be in operation in the U.S. close to 1,200,000 hp on feed pumps employing Gýrol Fluid Drives.



In the past ten years, about 250 new generating units (total capacity: 25 million kw) have employed Fluid Drive on the feedwater pumps. This number will jump sharply. For, present U.S. capacity of 100 million kw is expected to increase by 275% within 25 years.



TODAY, Gýrol Fluid Drives save power in plants using conventional fuels, and tomorrow will figure prominently in atomic-powered systems. Stepless speed control of Fluid Drives also saves power on mechanical draft fans; simplifies motors and starting.

Drive for feed pump control!

Here's how power plants of all sizes are using American Blower Gýrol Fluid Drive to prolong equipment life, reduce pressure, save power!

To make more net generating capacity available to consumer lines, more and more power plants of all sizes are turning to Gýrol Fluid Drive to transmit power from the prime mover to the pump.

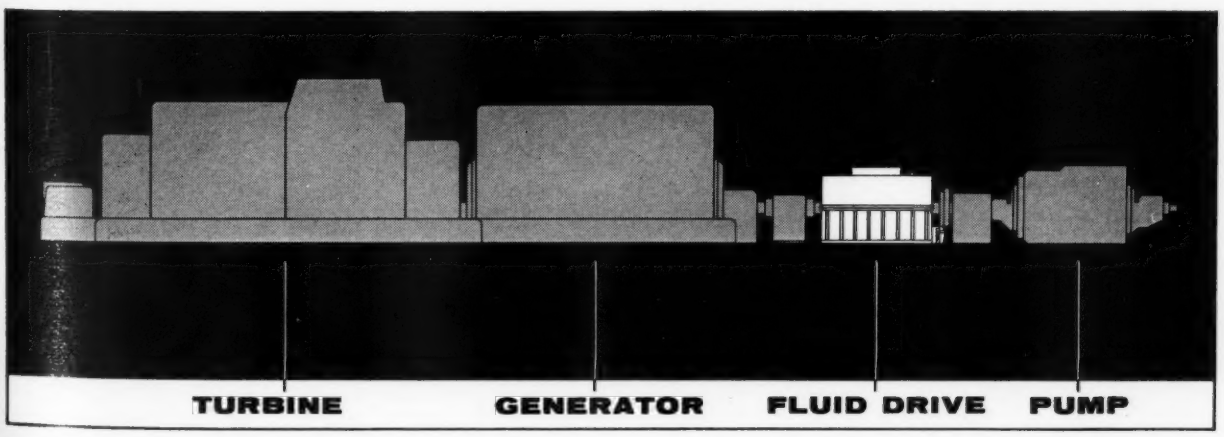
For, of all power-plant auxiliaries, the boiler feed pump and its prime mover consume the greatest single segment of invested power: an average 2.5%. And, with higher steam pressures and temperatures, estimates of 4% to 6% are being discussed for the immediate future—indicating the necessity for power-saving adjustable-speed pump control through the use of Fluid Drive.

The reason for the big swing to Gýrol Fluid Drive lies in the inherent advantages it offers. The use of Gýrol Fluid Drive results in a substantial savings in power, since on present-day, modern high-pressure boiler installations it permits reduction in pressure by use of the Gýrol Fluid Drive's adjustable-speed feature. This reduction in pressure often amounts to 500 lbs. or more.

Through the use of Fluid Drive, the boiler feed pump need only be driven at speed necessary to overcome system friction and boiler pressure. This results in lower pump operating speeds; lower duty on piping, high-pressure heaters, and valves—reducing maintenance and extending equipment life.

In the power-plant industry, Fluid Drive is renowned for its flexibility of control. The narrow range of speed over which a boiler feed pump must operate requires fine increments of speed adjustment, coupled with the need for quick response. The stepless, infinitely adjustable speed control of Gýrol Fluid Drive, together with its rapid response, more than meets this requirement. The Gýrol Fluid Drive has been engineered and designed to be conveniently linked to standard boiler feed water automatic control systems.

In your plans for power expansion, it will pay you to talk to an American Blower engineer. His knowledge of the application of Gýrol Fluid Drives, and American Blower's many other power-plant products, can prove invaluable to you. Just contact your nearest branch office, or write to us direct. American Blower Corporation, Detroit 32, Michigan. In Canada: Canadian Sirocco Company, Ltd., Windsor, Ontario.



THINGS TO COME. World's largest boiler feed pump—now being built for Consolidated Edison Co. of New York, Inc.—employs a new concept of drive: the main generator steam turbine. Twice as large as any feed pump now in existence, pump is rated at 12,000 hp, with power transmitted through an American Blower Type VS, Class 6 Gýrol Fluid Drive. For full details on American Blower equipment —Fluid Drives, Mechanical Draft Fans, Fly Ash Precipitators, Dust Collectors, Heavy Duty Steam Coils—contact our nearest branch.

AMERICAN BLOWER

Division of American-Standard

one of its engineers into acts of malpractice." I believe that a corporation has the same inducement and inclination . . . as an individual or a partnership does . . .

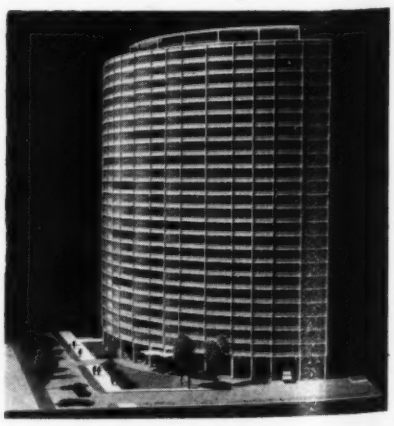
Senator McCawley is probably on firm legal ground when he argues that registration laws should not regulate corporations . . . Most attempts to limit corporate practice have probably been intended to prevent the unqualified from practicing engineering under cover of a corporate business. Registration laws should be so drawn that they will accomplish this end insofar as possible without restricting the type of business organization through which engineering is offered. I believe that a long step in this direction would be to include in State laws provisions regulating advertising so that only those firms which have qualified professional engineers' service to offer may contract for or even advertise professional engineering services.

William A. White
Executive Secretary
California Council of Civil Engineers and Land Surveyors

Architects' Credit

Sir:

I was very pleased with the presentation of my article on the new A.C.I. Building Code. However, no mention was made of the architects



who designed the building in the accompanying picture (June, p. 38).

This curved front skyscraper apartment building was designed by Hausner and Macsai, architects, of Chicago, Illinois, and it is believed that this structure will be an outstanding addition to our beautiful lakefront.

Paul Rogers
Paul Rogers & Associates
Structural Engineers
Chicago, Ill.

Triple-Barreled AMVIT* jointed clay pipe line resists chemical attack from industrial wastes

International Business Machines Corporation, Kingston, New York

Contractors

Turner Construction Company
Campbell Building Company

Engineers and Architects

Giffels & Vallet, Inc.
L. Rossetti

THIS triple-barreled Amvit Jointed Clay pipe line now carries thousands of gallons of chrome plating, cyanide, acid and alkali solutions from I.B.M.'s Kington, N. Y. plant to a nearby treatment plant.

The Amvit Joint was specified for this tough job because like the pipe, it is unharmed by underground service.

Joint is Trouble Free

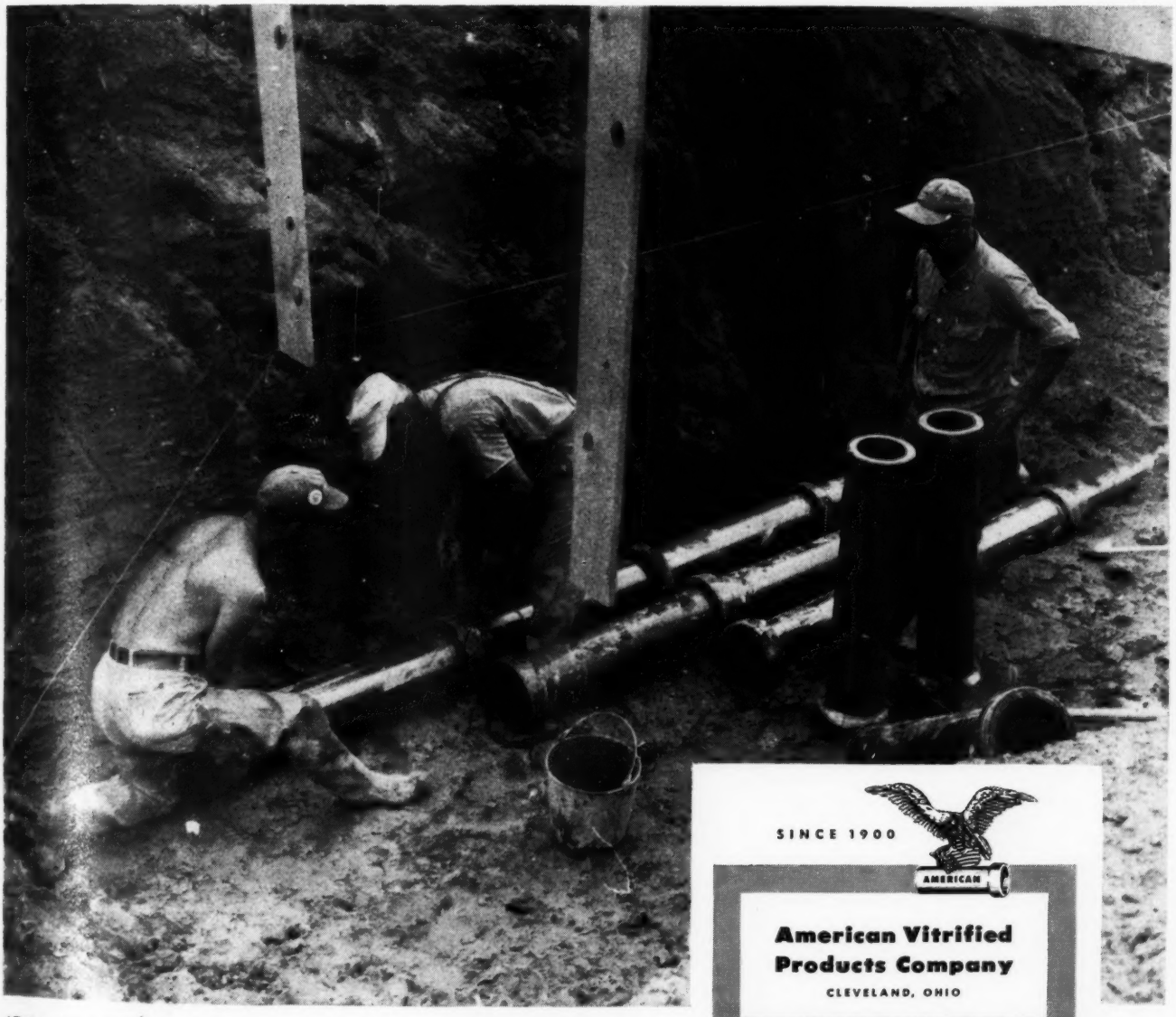
A true mechanical joint, Amvit is made from plasticized resins of polyvinyl chloride. Laboratory tests prove Amvit jointed clay pipe is corrosion proof and resists attack from most acids.

Prevents infiltration, exfiltration

Amvit is a compression type joint on the ball and socket principle. No adhesives or other compounds are needed to make a tight seal. Just push the pipe together and the line is complete. Nothing can enter or leave the line.

Amvit Jointed Clay Pipe, in sizes 4" through 24", together with all fittings is available for immediate delivery in the Northeast and Central States.

For more information, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.



*T. M. Registered. Patents Pending

Photograph by Doug Campbell

SINCE 1900

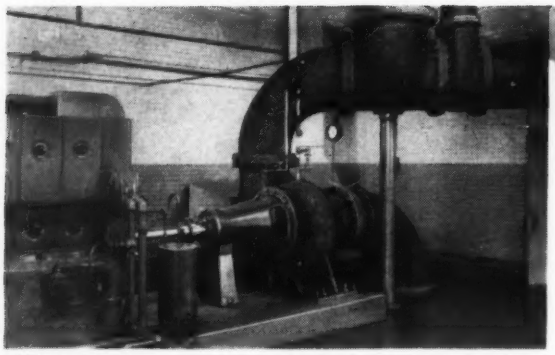
AMERICAN

American Vitrified Products Company

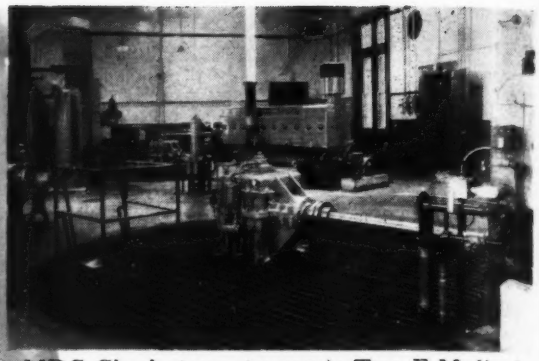
CLEVELAND, OHIO

MANUFACTURERS of: Clay pipe, flue liners, clay liner plates and concrete pipe.

Plants Across the Nation... Brazil, Indiana • Chicago, Illinois • Cleveland, Ohio • Crawfordsville, Indiana • Detroit, Michigan • East Liverpool, Ohio Fenton, Michigan • Grand Ledge, Michigan • Lisbon, Ohio • Los Angeles, California • Milwaukee, Wisconsin • South Bend, Indiana • Uhrichsville, Ohio



MDC Quincy (sewage): Twin 20" F-M "Angle-flow" pumps are driven by F-M diesels in this station recently converted from steam power.



MDC Charlestown (sewage): Two F-M diesels drive 36" F-M vertical pumps. The engines also drive 20 kw. F-M generators.

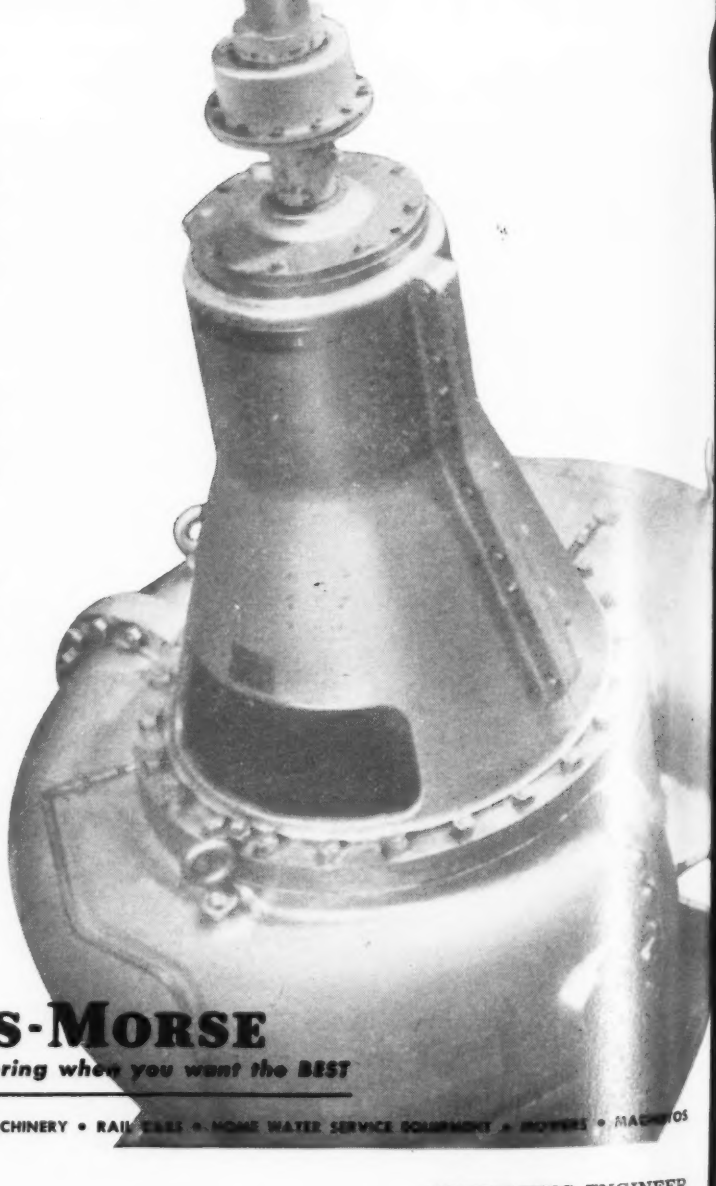
When the lights go out

...MDC keeps pumping. MDC is the Metropolitan District Commission, an organization which exists to provide coordinated municipal services, parkways and recreational facilities for Boston and many of the cities and towns which are integrated in the metropolitan area.

Many of MDC's water and sewage pumping stations are completely self-sufficient. Others, dependent for normal service on utility electric power, have stand-by power of their own—just in case the lights go out.

Fairbanks-Morse has supplied the driving as well as the driven member in many MDC installations. F-M diesels drive F-M pumps in continuous service. Other F-M pumps are driven by F-M motors. Still others, diesel powered, are standing by for the possible emergency.

Whatever your problem in municipal pumping, Fairbanks-Morse has the pump . . . and the driver . . . and the engineering to solve it. Fairbanks, Morse & Co., Chicago 5, Illinois.



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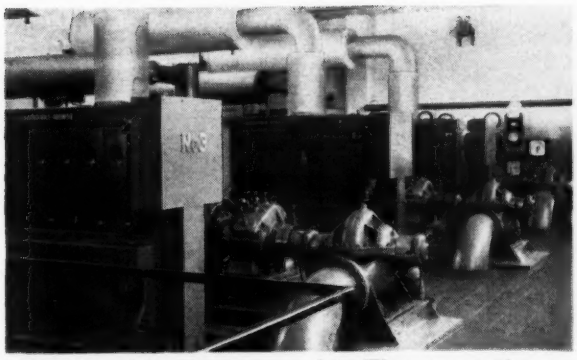
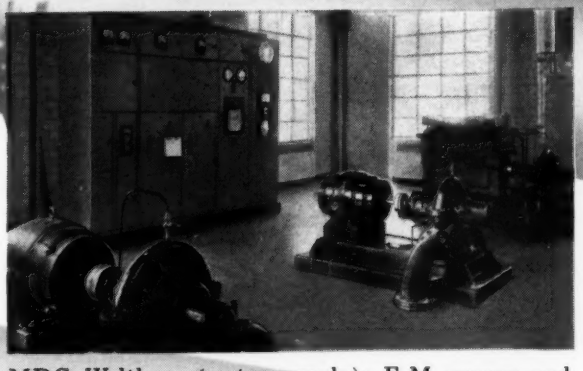
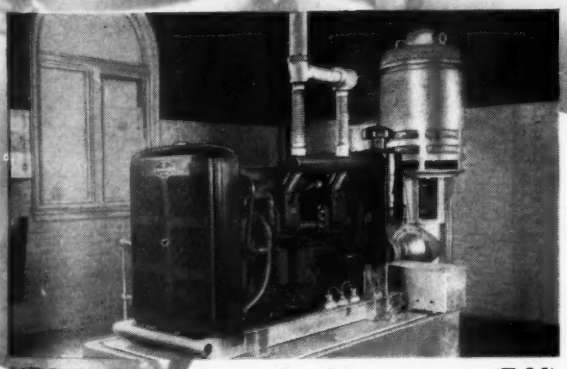


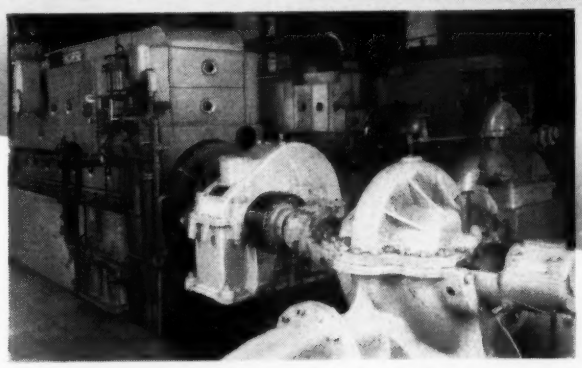
MDC Brookline (water supply): The new station on Newton Street houses three F-M centrifugal pumps and three F-M diesel engines.



MDC Waltham (water supply): F-M pumps and F-M motors fill routine demands. A third pump, powered by an F-M diesel, stands by for emergency.

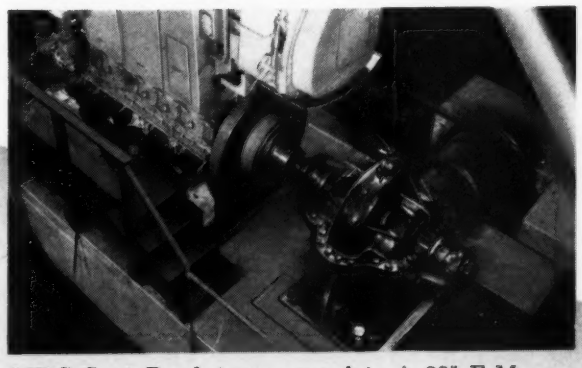


MDC Reading (sewage): In this two-pump (F-M) station, an F-M diesel can take over in the event of power failure to the 100 hp. F-M electric motor.



MDC Arlington (water supply): In a station recently converted from steam power, Fairbanks-Morse centrifugal pumps are driven by F-M diesels.

MDC Alewife Brook (sewage): In this new all-electric pumping station, two 36″ and one 16″ F-M "Angleflow" pumps are motor driven from the floor above.



MDC Spot Pond (water supply): A 20″ F-M centrifugal (illustrated) and a 36″ F-M turbine, driven by F-M diesels, are taking over from steam.

Scraps & Shavings

EVERY WAY THE U.S. consulting engineer turns he runs into a wall of misinformation. We are all familiar with the ignorance of the American public as to the functions of the engineer in private practice, and most of us have accepted the fact that it will be many years before the work of the engineer is understood as well as that of the architect, the medical doctor, or the lawyer. It is surprising, however, to find that our European contemporaries, our fellow engineers in private practice, have such incorrect ideas as to our methods of operation.

The difficulty arises through the experience of these European consultants in dealing with American firms competing with them for foreign business in the less industrially developed countries. The independent consultants of Europe, when they go after a job in India, Iran, or the East Indies, find that their U.S. competition is not an independent American consultant, but a large firm of engineer-constructors offering to do a turn-key job. From this, the Europeans jump quickly to the conclusion that all the engineering work in the U.S. is done by large firms who undertake a job from conception to operation.

We are guilty of a similar mistake, for there are still many American engineers who believe that no independent consultants practice in Europe. They believe this because their competition on foreign work has come from large British, German, or Swiss manufacturers who give engineering design work "free" in return for the purchase of their brand of equipment.

The fact is, and it is high time it was known on both sides of the Atlantic, that by far the majority of engineering work done for clients on both continents is done by small to medium size engineering offices made up of independent consultants. Our major complaint, at the moment, is that European consultants refuse to accept this statement as true. You tell them the facts, you present statistics to back up your statement, and they politely look away as though they did not want to embarrass you by looking at you directly while you passed out that kind of malarkey.

They also seem to be upset by their belief that U.S. consultants advertise profusely. Again, they appear to doubt you when you tell them that it is hard to find ten independent consulting engineers in the U.S. who have ever carried display advertising in any publication. The fact is that European consultants are much more publicity conscious than we are in this country. They are, in several countries, well ahead of us in that they are doing fairly extensive educational advertising through their associations, while in this country the California Association of Consulting Engineers is the only one that has done any advertising, and that on a very small scale.

The third major misconception is more difficult to handle. It has to do with educational standards for engineering degrees. While they are most tactful about it, it becomes clear in any conversation dealing with education that they think that most of our schools teach engineering on some subprofessional level about equal to a trade school. (Explanations here become complicated, for to them a trade school is what we call a business college.) The standard question is, "How does a school such as California Tech compare with Harvard?" Since Harvard does not teach engineering on an undergraduate level, this is a hard question to answer. It is like trying to compare the quality of Boston beans with the flavor of California wines.

The truth is that the methods of operation of the independent consultants in Europe are much the same as those of independent consultants here. And so far as we could determine, the educational qualifications for engineering degrees are very close to equal.

It is clear that the Associations of Consulting Engineers in Europe are anxious to have the independent consultants in the U.S. form an association that would qualify for membership in the International Federation (FIDIC) to which their national associations belong. This, we think, would be most desirable, and we hope that the National Association of Consulting Engineers, as soon as it is in operation, will apply for membership in FIDIC. With increased international cooperation it should not be long before there is a clearer understanding among the independent consultants on both sides of the Atlantic. ▲▲

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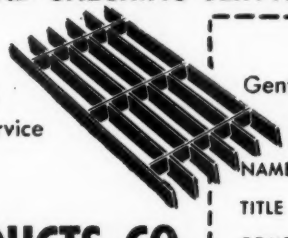

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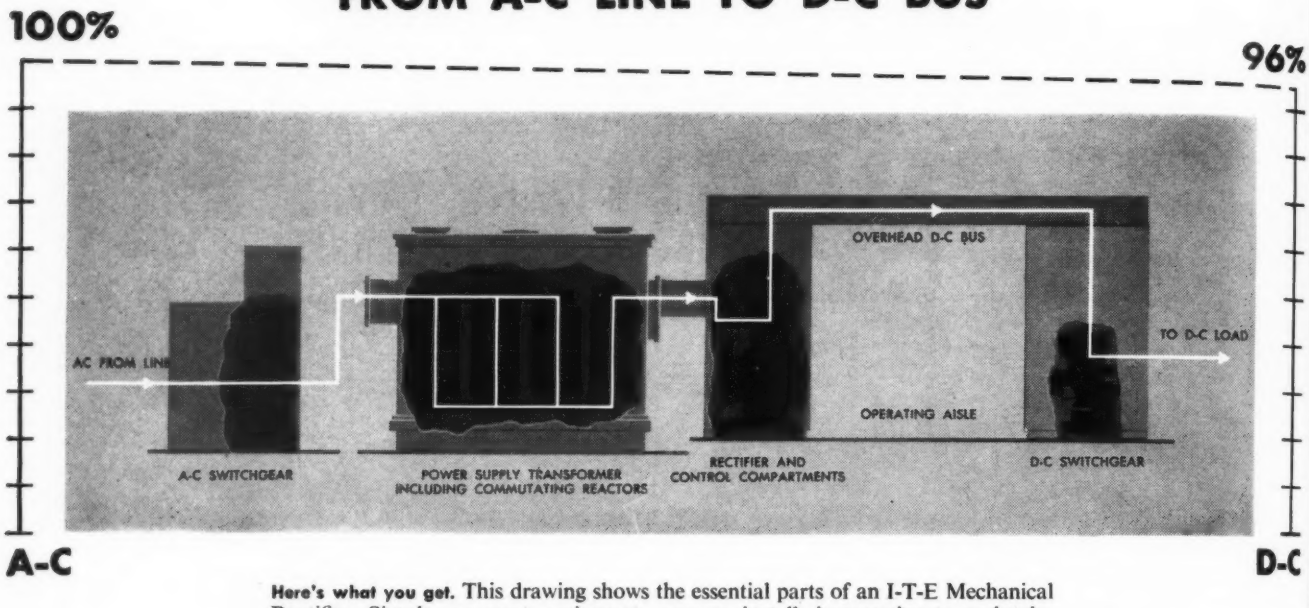

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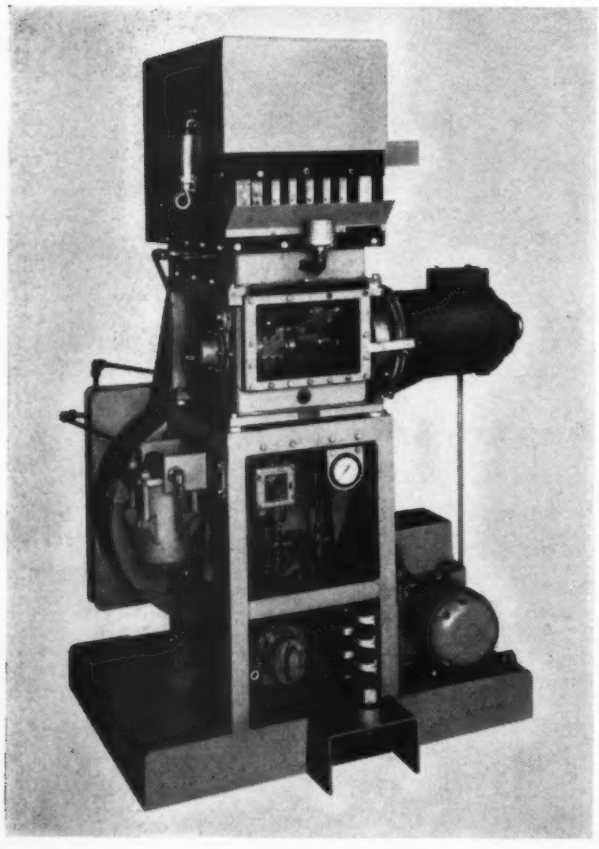

I-T-E Mechanical Rectifier operates at efficiencies of 96%—and higher!

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In case after case, I-T-E Mechanical Rectifiers have turned in efficiency performances of 96% and higher. Power losses are inherently lower. Contacts are pure solid silver—the best conductor known. Besides saving power, an I-T-E Mechanical Rectifier also saves you space, installation cost, and maintenance cost.

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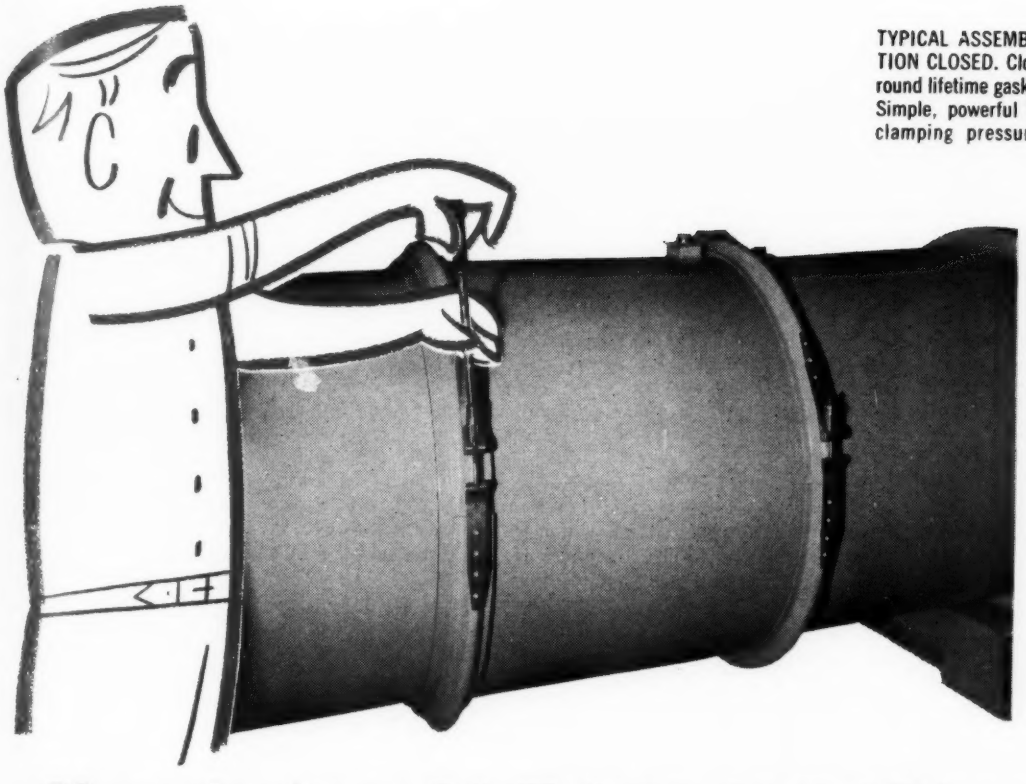
I-T-E Mechanical Rectifiers are available in single units—6000 through 12,000 amp and 24,000 amp from 50 to 250 volts d-c; 6000 amp and 12,000 amp from 250 to 400 volts d-c. For information, write I-T-E Circuit Breaker Company, Transformer and Rectifier Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

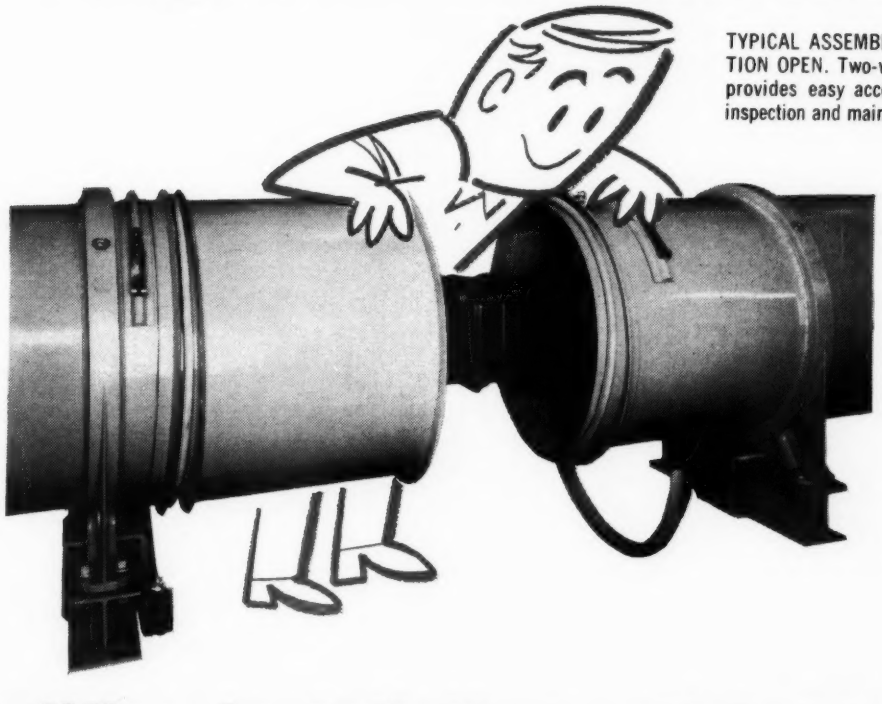
The contact mechanism. This is the heart of the I-T-E Mechanical Rectifier. Synchronous motor drives silver contacts. Switching is done during interval when current is held at zero by reactors.

I-T-E CIRCUIT BREAKER COMPANY • Transformer and Rectifier Division



TYPICAL ASSEMBLY WITH TELESCOPING SECTION CLOSED. Closure requires only two 1-piece round lifetime gaskets—easy to place and remove. Simple, powerful V-clamp couplings distribute clamping pressure uniformly around the ring.

New design of I-T-E Isolated Phase Bus



TYPICAL ASSEMBLY WITH TELESCOPING SECTION OPEN. Two-way sliding telescoping section provides easy access to connectors—simplifies inspection and maintenance.

simplifies installation and inspection

All-welded aluminum basic assemblies—joined together with 2-way sliding telescoping sections—cut installation and inspection time. A V-clamp closure and a 1-piece round gasket in each telescoping section joint assure a permanently tight seal. This new design reduces gasketing 75%. In addition, it combines great strength and light weight with structural simplicity. And smooth inside surfaces prevent the accumulation of moisture.

Bulletins 10004-A and 10004-B describe I-T-E Isolated Phase Bus designs. For copies of these bulletins, write I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

ATOMS IN ACTION

THE STEEL INDUSTRY'S interest in atomic energy was stressed by Charles M. White, president of Republic Steel Corp., at the annual meeting of the National Industrial Conference Board when he told the meeting that Republic has studied several reactor types that might be used to drive the blowing engines and heat the air used to operate a blast furnace. The studies also have led the steel company to consider other types of coking procedures, particularly the possibility of a continuous coker in which coal would pass a single point of heat input.

THE AUSTIN COMPANY has been retained as engineering consultant by Case Institute of Technology for a nuclear center that Case and a group of northern Ohio industries plan to build in northern Ohio, to be known as the Case Industrial Nuclear Center. An advisory group made up of Case faculty members and representatives of Cleveland Electric Illuminating, B. F. Goodrich, Albert Higley Co., National Carbon, Republic Steel, and Thompson Products, are working on the project.

CRANE OPERATORS at AEC's Hanford production plant are using color TV instead of periscopes for remote controlled plutonium extraction processes. The color TV gives added depth perception and better object resolution plus the fact that the remote manipulations involve color coded objects.

STANFORD RESEARCH INSTITUTE and Sequoia Process Corp. jointly have developed an irradiated polyethylene insulation jacket for wire and cable that is not subject to stress cracking. Known as "Hyrad," the material is usable for extended periods at 390 F, and is amenable to dip or iron soldering, since immersion in molten solder does not harm it at 480 F.

EDISON ELECTRIC INSTITUTE has approved formation of a Technical Appraisal Task Force on Atomic Power Reactors whose purpose will be to appraise various reactor designs and types as to their suitability for electric power production. The Task Force will be made up of scientists, engineers, and executives of EEI member companies and equipment manufacturing companies.

AEC HAS ASKED Congress for legislation enabling the Commission to provide aid for the conduct or support of educational training activities in the nuclear field, including loans, grants, and contributions to the cost of reactors and other equipment. Pointing out that only two universities now have operating reactors, AEC stated that only a few schools have other facilities necessary to train nuclear engineers, and, "None have the complete facilities which we believe to be necessary adequately to train engineers to work in the atomic energy field."

GENERAL ELECTRIC has been issued a construction permit by AEC for the single-cycle boiling-water prototype reactor to be built at G.E.'s new atomic laboratory in Alameda County, Calif.

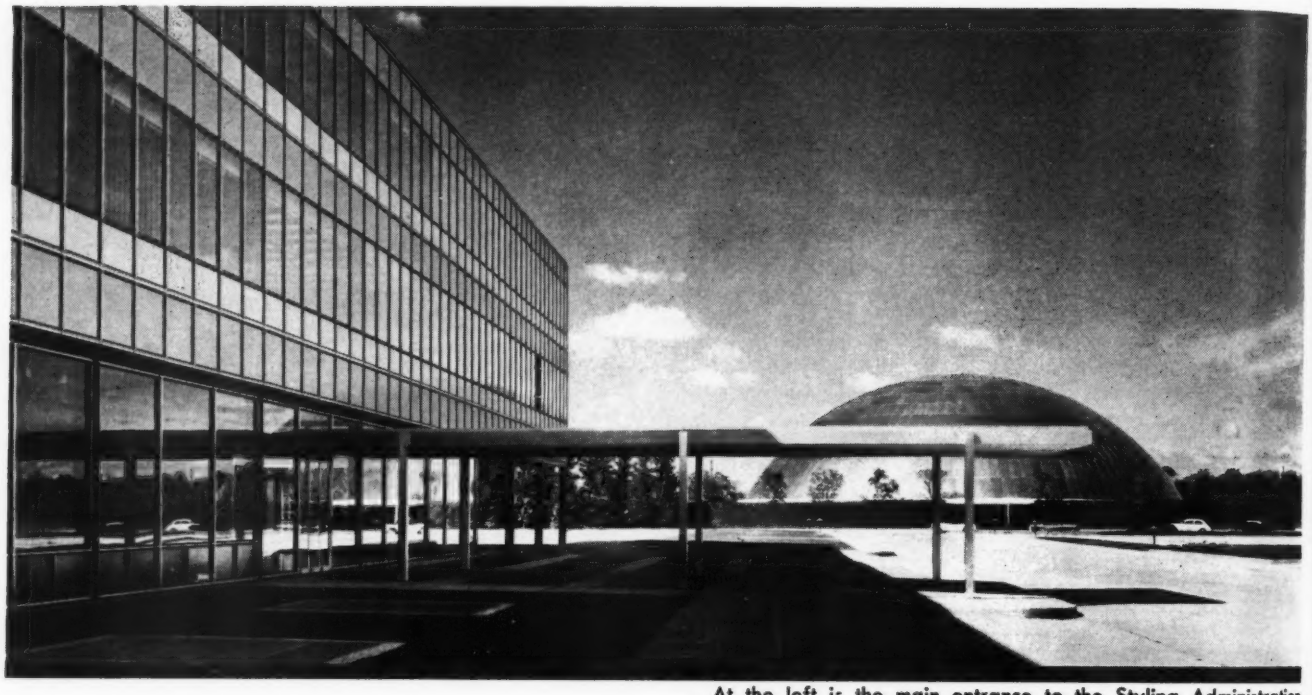
THE RURAL ELECTRIFICATION Administration has approved a $6.7 million loan to the Rural Cooperative Power Association for the coop's share of costs for the proposed 22,000 kw reactor at Elk River, Minn. AEC had already approved the proposal in principle and stated that final approval hinged on granting of a loan by REA.

POWER REACTOR DEVELOPMENT CO. has retained Commonwealth Associates, of Jackson, Mich., and United Engineers & Constructors, of Philadelphia, as architectural and construction engineers, respectively, for its atomic power plant project which is to be located near Monroe, Mich. Detroit Edison Co., which will own and operate the plant's conventional electric generating unit, has ordered a 150,000 kw steam turbine generator from Allis-Chalmers Co. The generator will operate on steam purchased from the reactor plant. According to Walker L. Cisler, president of Detroit Edison, $8 million already has been spent on the design and $2 million worth of reactor parts is on order.

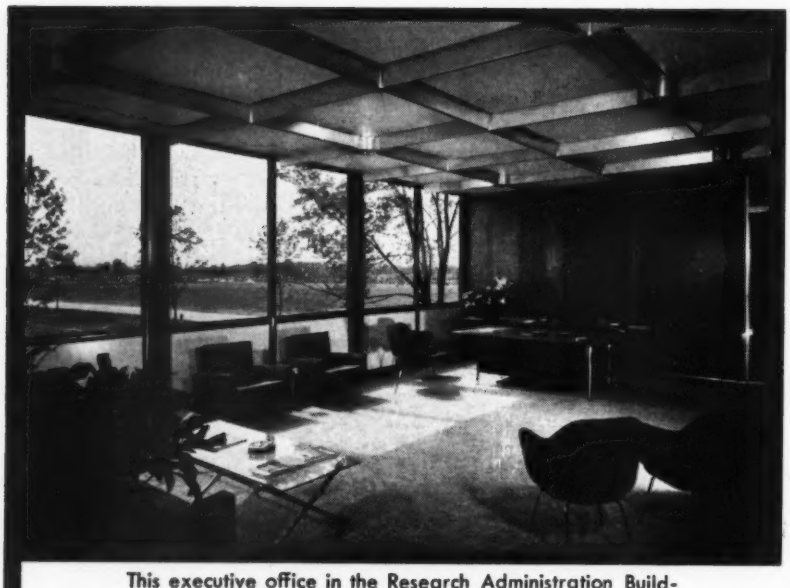
THE REFERENCE DESIGN for the 180,000 kw Dresden Power Station that General Electric and Bechtel Corp., of San Francisco, are designing for Commonwealth Edison Co., of Chicago, is 90 percent complete, according to Francis K. McCune, G. E. vice president. Plans for foundation and erection are essentially complete and Bechtel engineers already have started on final design for several features of the plant.

THE FIRST CONTRACT to be concluded under AEC's Power Demonstration Reactor Program has been signed with Yankee Atomic Electric Co., of Boston, for a 134,000 kw pressurized water cooled and moderated reactor. Under the contract, AEC will perform up to $1 million in research and development work in its own facilities and will underwrite up to $4 million for work performed in private facilities. Costs in excess of the $5 million will be paid by Yankee. Construction costs are estimated at $34.5 million, of which $18.5 million will be for the reactor and associated equipment. Westinghouse Electric Corp. is development and design agent for the project and Stone and Webster Co., of Boston, Mass., is the architect-engineer.

THERMOTANK'S *HIGH-VELOCITY* AIR CONDITIONING SELECTED BY FABULOUS GM TECHNICAL CENTER



At the left is the main entrance to the Styling Administration Building and in the background is the domed Styling Auditorium, two of the seven buildings air conditioned by Thermotank, Inc.



This executive office in the Research Administration Building shows a typical installation of Thermotank's custom-designed air diffusers with integrated sprinkler heads.

IN co-operation with General Motors' engineers, Eero Saarinen & Associates, architects, and Smith, Hinchman & Grylls, Inc., architect-engineers, Thermotank, Inc., helped design a new high-velocity, double-duct air conditioning system for seven of the buildings in the magnificent General Motors Technical Center. Using techniques developed through 30 years' experience in moving air at high speeds through tight spaces, Thermotank engineers provided a streamlined duct design with noiseless Thermo-Reg mixing boxes and high-velocity ejection ceiling diffusers, which incorporate sprinkler heads and are integrated with the ceiling acoustical treatment. Thermotank invites inquiries about further details of this advanced system of high-velocity, year-'round air conditioning.

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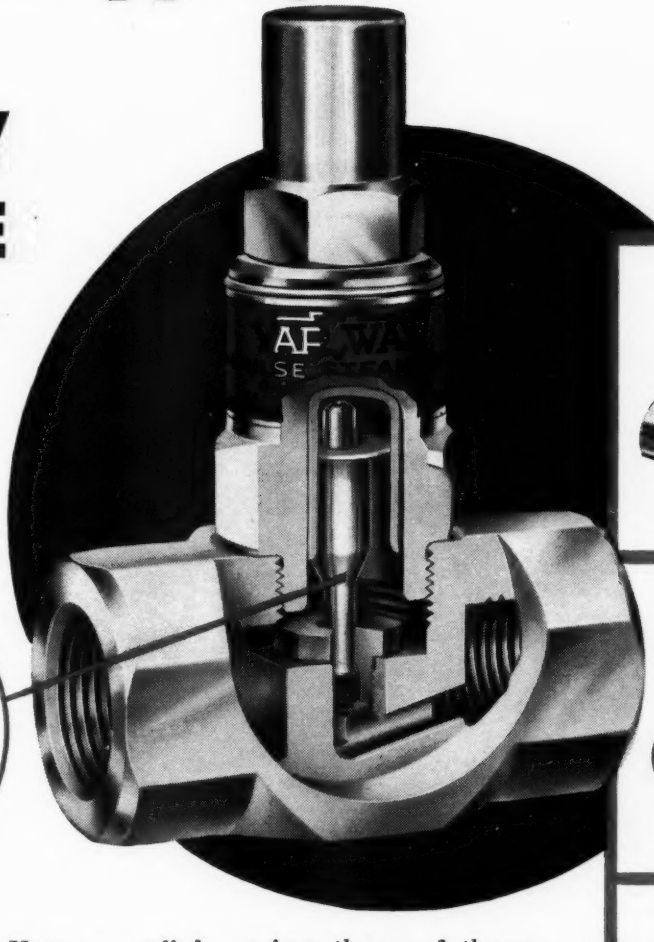

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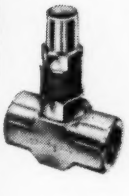

For *light loads* on tracer lines, steam mains, small presses, etc.

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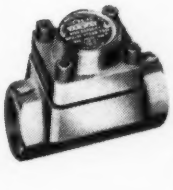

For *heavy loads* requiring extra high capacity steam traps.

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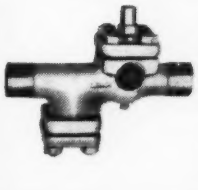

For *high pressures, high temperatures.* (Flanged or welding connections.)

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Economic News Notes

E. J. MacDonald
INDUSTRIAL ECONOMIST

SIGNIFICANT POLL — A carefully selected group of steel users was asked in late May by the Research Institute of America how much of the current steel order volume was a hedge against a steel strike or price rise and how extensive cancellations would be in the event of a no-strike settlement. Replies were unsigned. Only four out of 10 industrial steel users said they had accumulated inventory in anticipation of a strike or price boost. Of these, only about one-fourth said they would cancel orders if a strike did not materialize. Gist: orders of nine out of 10 steel users polled were firm.

LONG-RUN TREND? — Quality industrial space was in increased demand throughout the nation and commanded premium prices around many cities during the first half of this year. The demand for one-story business buildings has been stepped up as a consequence of greater use of mechanical equipment in material handling. These findings were disclosed in information gathered by the Society of Industrial Realtors and analyzed by a panel of National Association of Real Estate Boards mortgage study committee members.

EXPANSIONARY FORCE — Business plans to increase outlays on new plant and equipment from current record level to an all-time record annual rate of $36.8 billion in the 3rd quarter of this year. The latest joint survey of SEC and Department of Commerce points out that planned 3rd quarter outlays are almost 25% higher than actual outlays of the same period last year. The course of spending for expansion and modernization of the nation's productive facilities has been the principal expansionary force in the economy this year.

HOLD-UP — The proposed 300-mile turnpike from Cincinnati to Conneaut may remain in the plan-stage for some time. Deferment has been recommended by an investment banker group for a number of reasons: more time is needed before operating experience on Ohio's east-west turnpike will become definitive; current market conditions are unfavorable for toll-road bond issues; and the effects of the huge Federal highway program on state projects need further study.

DIFFERENCE OF OPINION — At the June meeting of ASCE, Dean of Engineering N. Dougherty, University of Tennessee, advocated more math and science for the civil engineering student — "more know-why and less know-how." ASCE president E. Needles took a different tack in recommending that emphasis be put on courses with practical and specialized contents.

MODERN DESIGN — Rapidly changing conditions in school population will force major changes in school construction during the next 10 years to provide a flexible school interior that will accommodate groups of widely varying sizes. This was one of the predictions made at a meeting of the Baltimore Chapter of the Producers Council. It was estimated that Maryland will need 6,750 more classrooms in the next four years to seat the anticipated growth of school-age population.

HALF-DOUGH NO-GO—" . . . unfavorable reaction from colleges and other companies" led IBM to abandon its short-lived device of giving half-pay to graduating engineers from spring, when they were recruited, until graduation in June.

BUT REAL — The "fantastic" demand this Spring for engineering grads has hampered classroom routine, lured away sorely-needed instructors, and "resulted in sharp practices by some recruiters." Such is the picture drawn in the 21st annual survey of college placements by Northwestern National Life Insurance Co. The survey disclosed an average base starting pay for "newly-minted" engineers of around $420-450. Add to this such extras as overtime premiums, graduate study assistance, and moving expenses. Wonder how they do it in Russia?

THROUGH THE TRANSIT — Copies of the report "Professional Standards and Employment Conditions" are available without charge at Engineers Joint Council, 29 West 39th St., N. Y. 18 . . . The South's share of the nation's $35 billion industrial expansion this year will be almost one-third, says Dr. F. J. Soday, vp of research and development at Chemstrand . . . The privately-owned electric power industry will double its generating capacity in the next 10 years at a cost of more than $40 billion, predicts Mr. H. Branch, ex-president of Edison Electric Institute . . . "More . . . courageous attitudes" are needed on part of federal and municipal officials if Sec. 220 housing rehabilitation mortgage insurance is to achieve "even a fraction" of its urban renewal potential, says House Subcommittee on Housing.

The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

The Law of Sales (IV)

THE PROBLEM posed last month involved a written contract for the sale of specifically designated aluminum sheets stating that the purchaser had examined them. In a suit for breach of warranty, he sought to prove that the aluminum was corroded and unfit for resale to manufacturers of aluminum products, and that although he was given an opportunity to inspect the sheets, he did not do so because they were piled in heavy, high bundles in a warehouse and it would have been difficult to do so. Is this evidence admissible?

Held: No. The court held that parol evidence of any warranties could not be admitted. The written integration of the agreement excludes the possibility of admitting parol evidence to show the existence of any express promissory warranty. Furthermore, evidence is inadmissible to show the existence of any representations of fact which could lead to an implied warranty of fitness of purpose, because the circumstances indicate that the buyer was to rely on his own inspection rather than on representations of fitness or quality. The fact that the buyer did not actually inspect the goods does not change this. Salzman *vs.* Maldaver, 315 Mich. 403.

Remedies of the Seller

Where title to the goods has passed to the buyer, and the buyer wrongfully refuses to pay for them in full, the seller can maintain an action against him for the purchase price (less what has already been paid). This is the most common situation, but it frequently leaves the seller in an unenviable position. He is only a general (i.e. unsecured) creditor, and if the buyer is uncollectable or insolvent, the seller will not be able to recover the full purchase price, even though he has a judgment for it.

Where title to the goods has not yet passed when the buyer repudiates the transaction, the seller, in general, cannot recover the full purchase price, since he still owns the goods. All he can recover is damages for breach of contract, i.e. his lost profits, if any. If the goods are salable elsewhere, his damages will be the contract price less the market value. If this is zero or negative, he can recover only nominal damages, i.e. six cents. If the goods are not salable he can recover the full contract price (less any salvage value).

Terminating the Contract

When title has not passed at the time of the seller's breach or repudiation of the bargain, the seller also has the alternative of rescinding or terminating the contract instead of suing for damages. In this case, he must return any payments he has received, and he can recover the goods if the buyer has received them. There are no damages in this case, since the contract has been "called off." It must be emphasized, however, that the seller cannot recover the goods from the buyer merely because of failure of the latter to pay the purchase price, if title has already passed to the buyer.

When title has passed to the buyer and the buyer is not only unwilling to pay but is uncollectable, the seller has no effective remedy except in certain special situations, which are discussed below.

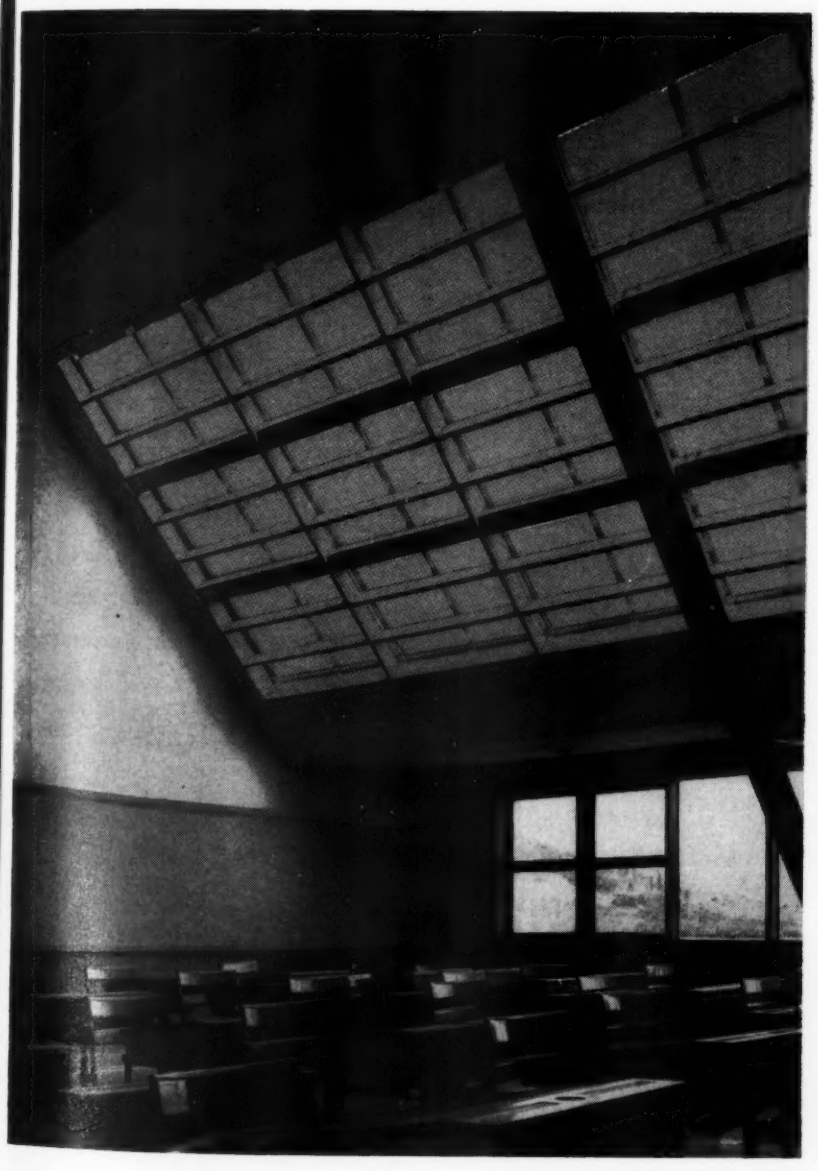
Recovery of Goods

If the sale is voidable by the seller because of mistake, fraud, misrepresentation, duress, lack of legal capacity of the seller, or illegality, the seller has the right to recover the goods from the buyer if the latter still has them. The buyer is, in such a case, regarded as a constructive trustee of the goods for the benefit of the seller, who is regarded as

Bring in the DAYLIGHT

Filter out GLARE and HEAT

with AKLO® GLASS by BLUE RIDGE



Aklo Glass helps you meet a constant design challenge . . . to get the full benefits of daylight without the natural discomforts of sun heat and glare.

This California classroom illustrates a successful solution:

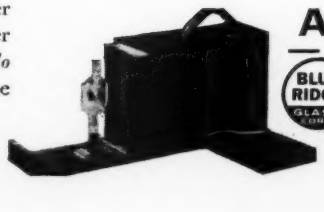
Frosted *Aklo* Heat Absorbing Wire Glass was used in skylights to subdue sun and sky brightness and to reduce direct heat from the sun. Its blue-green color even made the interior *look* cooler. ¼" *Aklo* reduces transmission of the sun's radiant heat energy as much as 44%.

These are good reasons you see *Aklo* widely used in floor-to-ceiling fenestration in up-to-date factories, offices and other buildings all across the nation. It's specified for better seeing, greater comfort, better workmanship, better employe relations.

Aklo Glass is readily available from your L·O·F Glass Distributor or Dealer (listed under "Glass" in phone book yellow pages). Or write to Libbey·Owens·Ford Glass Co., 608 Madison Avenue, Toledo 3, Ohio.

P. A. Walsh School, Morgan Hill, California
Architect: Robert Stanton, Carmel, Calif.

Phone for this test. Your L·O·F Glass Distributor or Dealer can show you, with a radiometer demonstration kit, how much *Aklo* reduces sun glare and heat. Phone him today.



AKLO GLASS FILTERS DAYLIGHT

BLUE RIDGE GLASS CORP.

made by Blue Ridge Glass Corp.

L O F GLASS

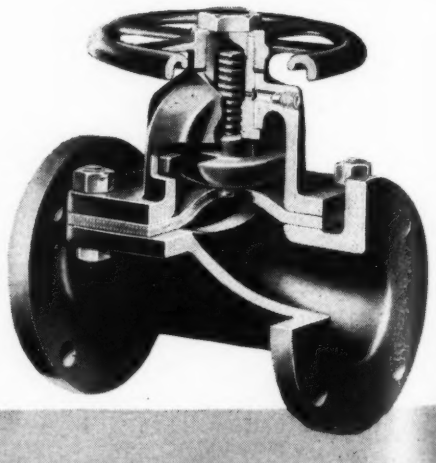
sold by Libbey-Owens-Ford Glass Distributors

9,121 ways to valve corrosive substances with HILLS-McCANNA valves

36 BONNET ASSEMBLIES	14 DIAPHRAGMS	27 BODIES
HANDWHEEL OPERATED—13 types including models with indicators, auxiliary handles, enameled bonnet and outside stem and yoke.	**RUBBER**—3 types including high acid/alkaline resistant, abrasion resistant and temperature resistant.	**CAST IRON**—ASTM Class 3 minimum.
QUICK OPENING—2 lever operated models go from full open to full closed in a 180° turn.	**NEOPRENE**—5 types including acid, alkaline, oil and heat resistant formulations, freeze resistant and white, noncontaminating formulations.	**CAST STEEL**—standard foundry finish.
SLIDING STEM—5 models to permit adaptation to a wide variety of operators.	**HYCAR**—acid, oil and heat resistant.	**CAST IRON, LINED**—choice of 8 linings including hard or soft rubber, neoprene, glass, lead, Saran and Lithcote.
EXTENDED STEM—2 models provide easier operation in difficult locations.	**TYGON**—acid resistant.	**CAST IRON, COATED**—Stalpic coated.
CHAINWHEEL OPERATED—1 model.	**COMPAR**—solvent resistant.	**ALLOY**—choice of 10 alloys including several types of stainless steel, Durimet, Everdur, Monel and Hastelloy.
AIR OPERATED—9 models offered with a choice of air cylinder or diaphragm motor operators.	**KEL-F**—acid resistant.	**ALUMINUM**—Cast.
UNBALANCED HYDRAULIC OR PNEUMATIC—1 model utilizing pressure on valve diaphragm to close, line pressure to open.	**POLYETHYLENE**—acid resistant.	**NICKEL**—97%+ pure.
MOTOR OPERATED—3 models providing a choice of electric motor operators.	**TEFLON**—maximum chemical resistance.	**PLASTIC**—Choice of 4 materials: polyvinyl chloride, Uscolite, Saran or polyethylene.

In this unmatched selection of operators, diaphragms and body materials is the answer to virtually every corrosion resistant valving problem. In addition, nearly 25 years of application of the Saunders Patent valve by Hills-McCanna has developed extensive experience records on the best way to handle thousands of corrosive substances. The combination of a complete choice of materials plus Hills-McCanna "know how" is your assurance of getting the *best* valve for your service.

Hills-McCanna diaphragm valves are offered in sizes from ⅜" through 14". Dependent on size and type of body and diaphragm materials, they will handle pressures to 150 psi, temperatures to 350° F. For specific recommendations send an outline of your corrosion resistant valving problem. To have full data at hand, ask for the Hills-McCanna valve catalog.



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Corrosion Specialists Since 1870

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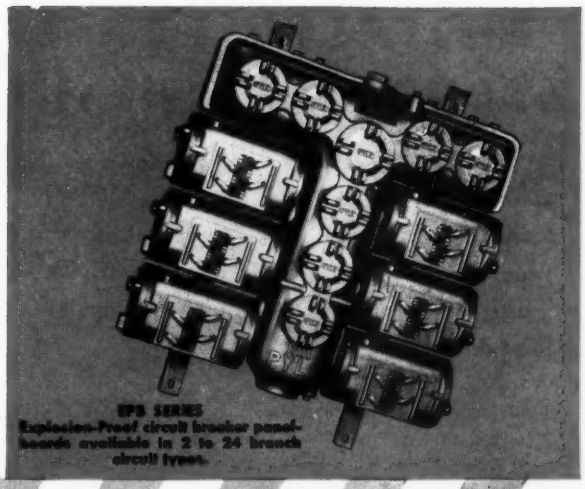

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ECONOMY: PYLETS are designed for quick, easy installation and convenient maintenance. Rugged construction insures a long service life.

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- QUICK ACTING JOINTS
- DEPENDABLE MECHANISMS
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CIRCUIT CONTROLS • PLUGS AND RECEPTACLES • LIGHTING FIXTURES • FLOODLIGHTS

having the equitable title. In such a case, the seller can even recover the goods from a third person who has obtained title from the buyer, provided the third person had notice of the seller's equitable interest in the goods, or provided the third person has not paid full value to the buyer for the goods purchased.

If the goods are in the hands of a "bona fide purchaser for value without notice," the original seller cannot recover them. Even in this case, however, if he can trace the proceeds of the resale and identify them in the hands of the original buyer, his equitable title attaches to them as a substitute for the goods. Note that in all these cases, it is assumed that the sale was voidable. If the sale was valid, and there has been merely a breach of the bargain by the buyer, the remedies mentioned above are inapplicable.

Hypothetical Cases

As an example of this distinction (which also illustrates a very important practical factor in sales), consider the following two hypothetical cases.

Breach of Bargain

Example 1: Carthy sold and delivered 100 tons of copper to Duh at $300 per ton on credit. Duh has never paid Carthy anything, except his respects. Duh sold and delivered 50 tons of the copper to Egads at $400 per ton and was paid $20,000. He deposited this in his checking account, which was substantially empty at the time. Egads had no knowledge of the transaction with Carthy. The other 50 tons of copper that Duh received from Carthy were given to Duh, Jr., as a gift from father to son, and are in the son's possession. Duh subsequently withdrew the $20,000 from his checking account. He used half of it to buy 40 more tons of copper at $250 per ton, and lost the other half playing the horses. Duh is now insolvent having virtually no assets, but many creditors. In fact, he was insolvent at the time of the sale by Carthy to him of the 100 tons of copper. What remedies are available to Carthy?

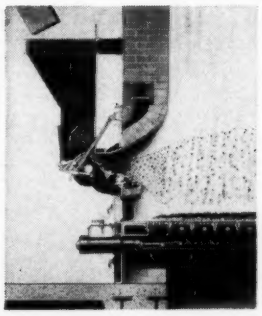
CHOOSE STOKER FIRING FOR ECONOMY AND SATISFACTION

Coal, Burned With a DETROIT STOKER Offers Many Advantages, Proven By Thousands of Installations

- **Assured Fuel Supply**
- **Provides Steam At Lowest Cost**
- **Dependable—Noted For High Availability**
- **Maintenance Expense Low**
- **Requires Little Power For Operation**

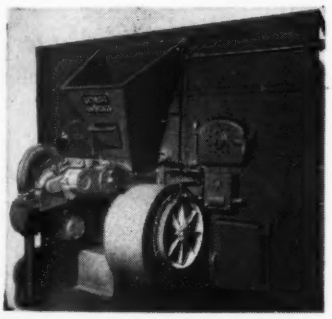
One of these Detroit Underfeed or Spreader Stokers will save you money—they are backed by over a half century of experience.

DETROIT ROTOSTOKER



Spreader stoker with OVER-THROW ROTORS that distribute the fuel uniformly in the furnace. Fine particles burned in suspension and coarse coal, burned on the grate. Four types of grates are available. Roto-Stokers burn successfully an extremely wide range of fuels without any special preparation. In combination with coal, RotoStokers also successfully burn wood and other refuse.

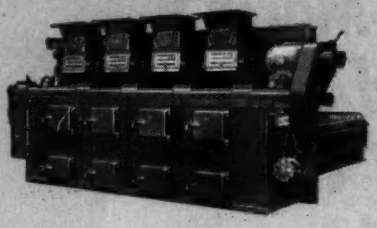
DETROIT UNISTOKER



Plunger feed, side-cleaning stoker is available in various sizes for 125 to 250 horsepower boilers. Full-housed blower either motor or steam turbine driven, mounted at stoker front. Adjustable Feed provides for either manual or automatic coal feed control.

DETROIT ROTOSTOKER TYPE C-C

(Continuous Cleaning)

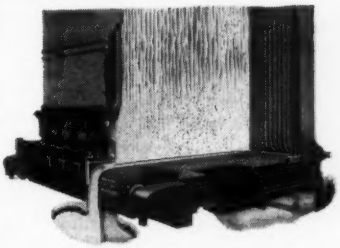


An important addition to the comprehensive "Detroit" line of spreader stokers. Readily applied to small and medium size steam generators approximately 5,000 to 75,000 pounds of steam per hour. The continuous cleaning grates automatically discharge the ash at the front for easy removal. No basement needed.

DETROIT DOUBLE RETORT STOKER

A multiple retort stoker having two retorts, with the side-cleaning feature requiring no basement. Now available with Detroit Adjustable Feed Coal Feed Control. For medium sized boilers.

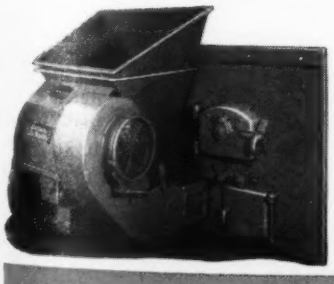
DETROIT ROTOGRATE STOKER



Spreader stoker with FORWARD MOVING GRATES for medium and large boilers up to approximately 400,000 pounds of steam per hour. Screenings or crushed run-of-mine coal used without grinding or pulverizing. Successfully burns a wide range of fuels, including lower grades of Bituminous Coal and Lignites . . . with preheated air if desired. Higher burning rates for longer periods with low excess air and without slagging or clinkering difficulties. Combustible in ash is unusually low.

DETROIT LOSTOKER

Has Detroit Adjustable Feed (Coal Feed Control).



A complete firing unit. Compact—single retort—mechanically driven—plunger feed—side-cleaning design. Many sizes and capacities for various types of boilers. Simple, accessible, dependable. A great coal saver.

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INVESTIGATE DETROIT STOKERS — IT'S THE ROAD TO ECONOMY AND SATISFACTION

Decision: Carthy is simply a general creditor in the amount of $30,000, and will have to share ratably with the other general creditors. Thus, he will recover very little of his $30,000.

Purchase by Fraud

Example 2: Assume the same facts as above, except that before making the sale, Carthy asked Duh about his financial condition, and Duh represented that he was solvent, knowing the facts were otherwise.

Decision: The sale is voidable for fraud. Therefore, Duh was constructive trustee of the 100 tons of copper, for the benefit of Carthy. The 50 tons he gave his son as a gift can be recovered by Carthy, since the son was not a "bona fide purchaser for value without notice," not having paid anything. As to the other 50 tons, they are in the hands of a bona fide purchaser for value without notice, Egads, and cannot be recovered from him. However, the proceeds of this resale were traced to Duh's checking account, and half of it is still traceable to the hands of Duh, now in the form of 40 tons of copper. Carthy can recover this, it taking the place of half the original 100 tons that Duh sold to Egads. Thus Carthy has equitable title to, and can recover, 90 tons of copper, and Duh owes him, in addition, one-quarter of the original debt, i.e. $7500 (representing the portion of the goods that ended up at the race track). As to the $7500, Carthy is a general creditor, and must share ratably with the other general creditors. But, as to the 90 tons of copper, he gets them free and clear of the rights of the other creditors.

The Unpaid Seller

The other situations in which the seller is better than a general creditor, even though title has passed, include the case of an unpaid seller in possession of the goods, and the case of an unpaid seller who has shipped the goods but while they are in transit discovers that the buyer is insolvent. In the latter case, the seller has the right to stop the goods in tran-

sit and have them returned to him. In either case, when he is in possession of the goods, he has a seller's lien on them, as security for the purchase price, and cannot be required to give the goods up without being paid. If the buyer doesn't pay within a reasonable time, the seller has power to resell the goods. He is not responsible to the buyer for any profit made on the resale, but is entitled to recover damages for any deficiency. The new buyer gets an absolute title. Alternatively, the seller who has a lien on the goods can rescind the sale, keep the goods himself, and return any payments made. He then becomes the absolute owner of the goods.

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Report from India

By S. S. PANI
CONSULTING ENGINEER CORRESPONDENT

CE exclusive

POWER RESOURCES of Madras, a state in southern India, are pitifully poor. It has no deposits of coal, and the closest mines are nearly a thousand miles away. Madras has only one perennial river of any importance, the Cauvery, which has been harnessed, and harnessed again, for the generation of electricity. The last bit of power has been taken out of the waters of this river and this year, with the onset of the broiling summer a bare few weeks ago, the need has arisen to ration power. In the town of Coimbatore, called the Manchester of South India, theaters are showing films without the fans switched on, and the sweating audience resort to cadjan leaves to keep cool. This lamentable shortage of power has been a matter of great concern to industrialists and government in Madras State, as well as to the public.

Lignite to the Rescue

Lignite may now come to the rescue — and there is considerable hope that this fuel will be the answer to a major power problem in this area. Current estimates are that if 1000 tons of lignite could be mined every day, the known deposits will last for over 2000 years, making this an important natural resource.

The presence of lignite in South Arcot district in the proximity of a very small village, Neyveli, has been common knowledge for over 125 years. In 1828, a Britisher, then collector of the district, came across lignite while digging a well. Almost a century later, a British firm in Madras, Binny & Co., took a few samplings — and there the matter ended.

Later Explorations

In 1947, an Indian mining engineer, H. K. Ghose, who had studied in Germany and Australia, revealed the potentialities of the deposit. Commencing operations of an exploratory nature near Neyveli, about 120 miles southwest of Madras City, he found that an area, about 6 miles in width and 17 miles in length, contained extensive deposits occurring about 18 feet below ground level and at some points reaching a thickness of 70 feet. At no spot did it come to the surface. The deposit lies between two seasonal rivers, the Gadilam and Manimukthar.

Further surveys, conducted between 1943 and 1947, revealed that in an area of 53 square miles

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Wrought iron pipe's "armed guard" against corrosion is a concentration of thousands of glass-like iron silicate fibers distributed throughout the metal.

These iron silicate fibers are relatively immune to corrosion . . . so any attacks by corrosion are evenly dispersed over the entire surface of the metal. As a result of this built-in protection, deep pitting and penetration are repelled . . . costly premature repairs and maintenance are eliminated.

Our booklet, "The ABC's of Wrought Iron" tells more of this story. You'll find it profitable reading. Write for your copy today.

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BYERS *Wrought Iron Tubular and Hot Rolled Products*

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

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FAN-A-GRAFICS
For Equipment Engineers

"Do's and Don'ts"
OF FAN APPLICATION

DO familiarize yourself with NAFM standards and practices.

DON'T use outlet velocity alone to measure suitability of a given fan to given performance. The ratio of velocity pressure to total pressure is the proper determinant.

DO remember that for a fan of given type and proportions at constant volume and constant point of rating, the wheel diameter varies inversely as the 4th root of the static pressure.

DON'T use multi-blade or close-bladed fans for handling dusts, air-borne solid materials, or under severely corrosive-abrasive conditions unless special construction is provided to resist wear.

DO avoid extremely high wheel speeds in materials handling fans, particularly under corrosive or abrasive conditions. For high-velocity requirements design for injection or induction, so material does not pass through fan.

DON'T obstruct flow to inlet of fans in plenums. Keep inlet at least one wheel diameter from walls or other obstructions. This is particularly important for double-inlet fans.

DO avoid turbulence at fan inlets or outlets, as fan performance may otherwise be adversely affected.

DON'T use direct drive unless performance is accurately determinable, variable speed driver is to be used, or good system control is available.

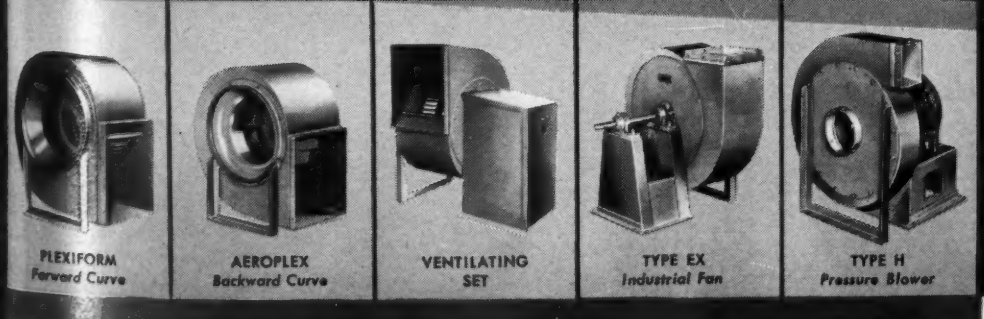
DO evaluate motor or prime-mover limitations when considering Arrangement 4 fan applications. This arrangement is particularly undesirable for large-size or heavy-duty fans.

DON'T specify or use small-fan arrangements having bearing in inlet. The bearing is excessively obstructive. Such arrangements are not regularly available in small size single inlet fans.

DO use double-width fans where headroom is a paramount consideration, rather than unduly small single-width fans.

DON'T specify arrangements having bearing in inlet if corrosive, abrasive, or high-temperature materials pass through fan. If double inlet fan is necessary, use inlet boxes and outboard bearing pedestals.

But Above All--
DO Specify
And Use
Bayley FANS



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AIR HANDLING EQUIPMENT

BAYLEY BLOWER COMPANY

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studied, 23 square miles contained lignite deposits between 149 and 253 feet below ground, with thickness varying from 51 to 105 feet.

Difficulties

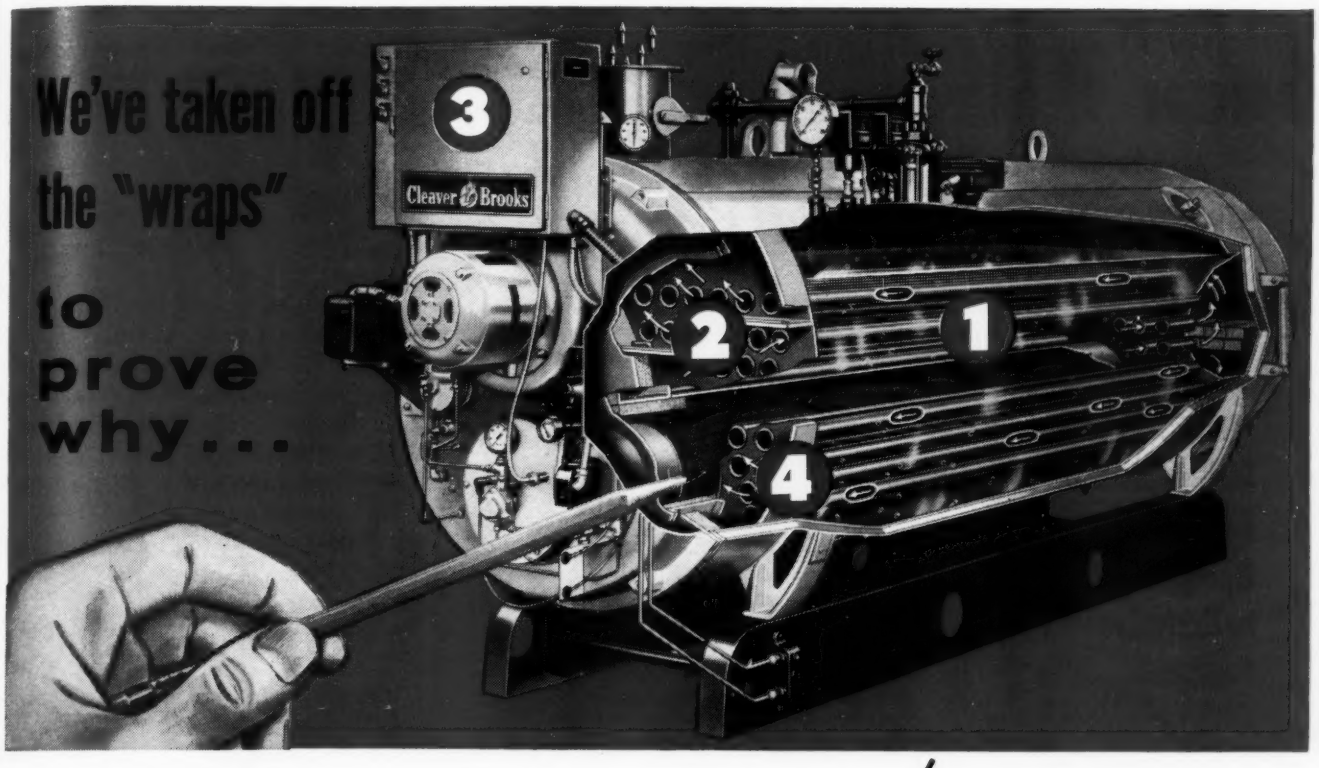
At this stage, when experimental bore holes were sunk to get at the lignite, a very formidable difficulty manifested itself — a difficulty encountered in no other part of the world where lignite is mined. Subsoil water was found below the lignite layer, which made the open pit method of excavation almost impossible. Later tests revealed that these subsoil aquifers exert a pressure of about 6 to 8 tons per square foot, making it extremely hazardous to start mining without reducing the pressure of water on the under-surface of the lignite layers.

It is now estimated that the depth of water under the lignite must be reduced to about 50 feet, which means that the water, which stood to a depth of 200 feet, has to be pumped out. The operation of pumping, using 14 pumps, each with a capacity of 1000 gallons per minute, commenced at the end of February. So far, 110 feet of water have been pumped out. It was originally intended to use 20 pumps for this job, but 6 pumps are still to arrive from the East German manufacturers.

Subsoil water resources in India are under investigation by a team of experts under Indo-American Technical Co-operation Agreement No. 12. It is hoped that the district of South Arcot, which has no perennial rivers or large reservoirs, will be able to make use of the water released from under the lignite for the growing of wet crops such as rice, which might ease the food shortage. South Arcot District now is growing ground nuts, sugar cane, and similar commercial crops.

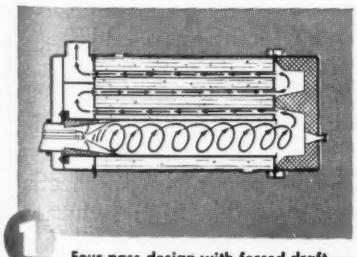
There currently is general optimism and a hope that the formidable problems presented by the aquifers are capable of being surmounted. The whole project has been included in India's second Five-Year Plan, and the total cost is estimated at Rs. 700 million — more than $150 million.

Pumping tests are being carried out on the advice of the Powell

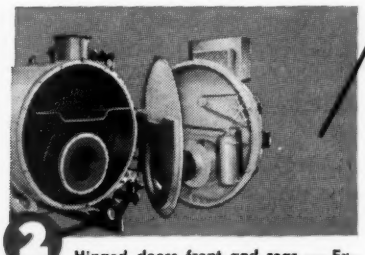


CB is America's most modern boiler

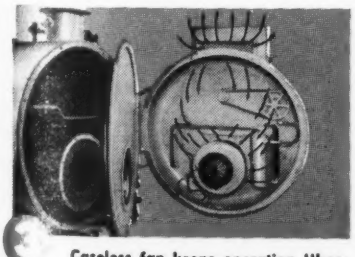
unmatched in performance quiet operation low-maintenance



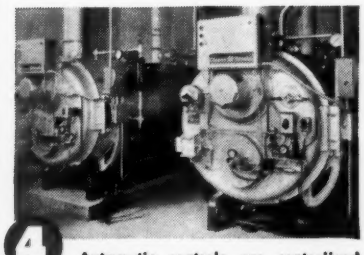
1 **Four-pass design with forced draft — Proved the most efficient combination to transmit greatest percentage of heat to boiler water. Blower provides cool, clean air in required density and volume for efficient fuel combustion — lowers fuel costs.**



2 **Hinged doors front and rear — Expose tubes for quick inspection or cleaning. Operating equipment and refractory stays intact. Cuts routine maintenance from hours to minutes. Doors are gasketed with preformed asbestos to be seal-tight.**



3 **Caseless fan keeps operation "hospital quiet" — Air is drawn into a large plenum chamber which confines and deadens air noises. Even at peak loads, CB is well within requirements for low sound levels where this is a factor.**



4 **Automatic controls are centralized for convenience, efficiency and safety — Air is metered with oil (or gas) in proper ratios to economize on fuel. Electronic flame failure control is standard equipment.**

CB boiler's remarkable performance in hundreds of applications has proved an "eye-opener" wherever installed. Take a minute's time and see why.

Combined into one boiler package are all the features *proved necessary* to: (1) save fuel dollars, (2) simplify maintenance, (3) assure silent performance, (4) maintain safe, automatic operation.

Talk to your nearby Cleaver-Brooks boiler representative — he can assist you in selecting the proper unit from a complete line of sizes, steam or hot water, 15 to 250 psi. Or, write direct for literature. Cleaver-Brooks Company, Dept. H, 321 E. Keefe Ave., Milwaukee 12, Wis., U.S.A. Cable Address: CEEBEEWEST — all codes.

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TWENTY-FIVE YEARS OF LEADERSHIP
BY THE ORIGINATORS OF THE SELF-CONTAINED BOILER

Duffryn Technical Services Ltd., of Great Britain, the services of this firm having been secured under the Colombo Plan as consulting engineers.

In the initial stages of the project, admirable assistance and expert guidance were rendered by Mr. Paul Reber Eyrich, of the U.S. Bureau of Mines.

Although from time to time various samples of the lignite mined at Neyveli have been analyzed in a number of laboratories as far away as Norway and the United States, as a final test, 30 tons are now under examination by German experts.

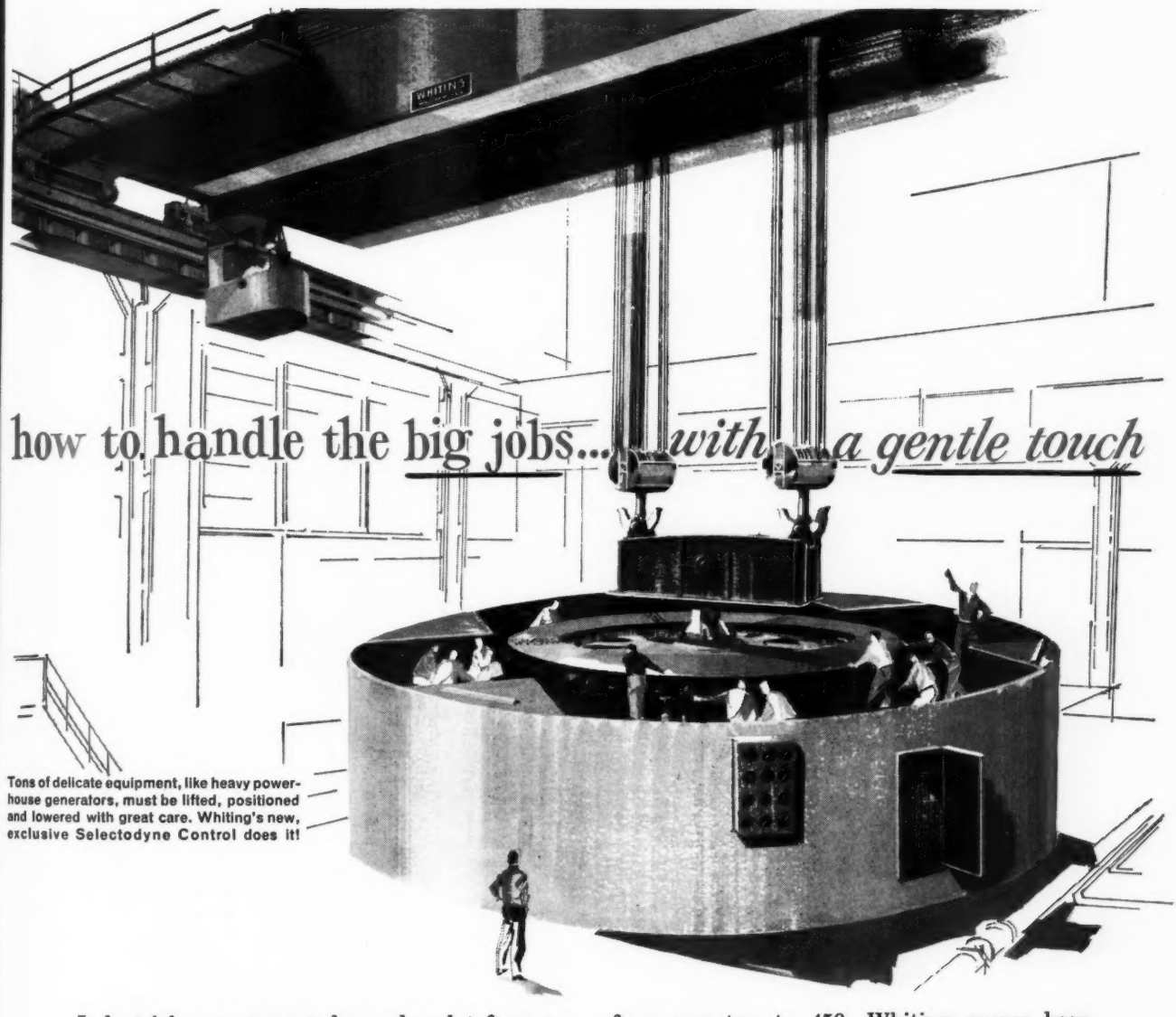
From time to time, samples have been analyzed at the following laboratories:

¶ Elektrokemisks A/s, Oslo
¶ Lurgi Gesselschaft fur Waermetechmilk m.b.H., Germany
¶ Power Gas Corporation, England
¶ Federal Institute for Examination and Experiments of Material for Industry, Civil Engineering, and Handicrafs, Zurich

The primary aim is to use the lignite as fuel for a 200,000 kw steam plant. It is further estimated that two hundred thousand tons of fertilizers could be produced per annum, side by side with a million tons of carbonized lignite, most probably in the form of briquettes, for industrial and domestic use. All this proceeds on the assumption that, when this mine is in full operation, 3¼ million tons can be mined, with 1½ million tons to be taken by 1960.

Another ambitious project which hinges on the success of the mining operations and the quality of the lignite is the starting of a steel mill using extensive deposits of iron ore from the adjacent Salem district. Coke would come from the lignite. With the help of German experts, a low shaft furnace method has been designed for using coke obtained from lignite.

Above the lignite deposits, clays of various types have been discovered and it is hoped, on the basis of experimental work already carried out, that these clays can be used for the manufacture of firebricks, domestic pottery, and insulators. ▲▲



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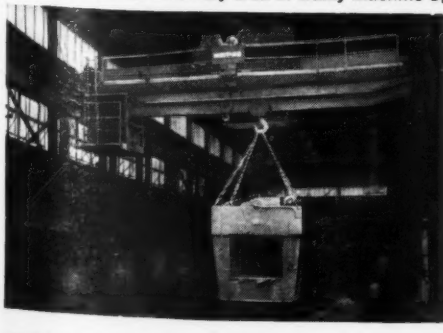

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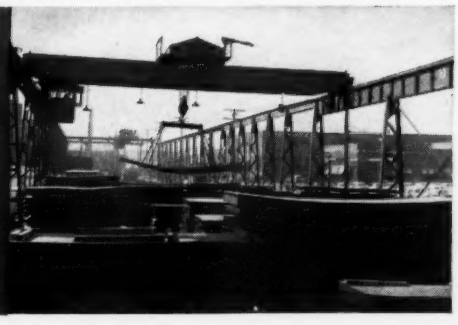


The Reader's Guide

Perhaps you have noticed the illustrations by Philip Reed, which are being printed regularly in this magazine. Reed is now a consultant to our art staff and is directing a gradual change in the make-up and layout, with the idea of making this the most attractive and readable publication possible. Philip Reed is more than qualified. He is one of the country's finest woodcut artists, an expert in typography, and an outstanding book designer. You may have noticed the change in the front cover, starting with the May issue. The type face of the title has been improved, and the photograph or drawing of the cover personality laid out in a new way.

Photo or Drawing

Incidentally, there has been an argument every month in the Editorial offices as to whether it is better to use a photograph or a drawing of the consultant featured on the cover. Some of the staff prefer photographs, others are strong devotees of drawings. Opinions of all sorts will be welcome.

Authors Abroad

While on CONSULTING ENGINEER's 1st European Tour, the Editor made some good contacts with European consultants who are now preparing manuscripts for publication later this year. One interesting article already on hand describes the work accomplished and that being planned for the reclamation of the Zuiderzee, changing areas once under water into productive farmland and prosperous towns. This is one of the world's most ambitious engineering projects. A Swiss engineer, Jakob Schneider, has been designing relatively tall buildings (8-14 stories) with load bearing brick walls. He is now writing an article for the readers of CONSULTING ENGINEER telling of the advantages of this type of construction. Jean Venturini, a French consultant who is an expert on rockets and guided missiles, is currently working on an article telling what the French have accomplished in this field and how the consulting engineer fits into the picture. With these and other articles by Europeans scheduled for publication in the near future, the readers of CONSULTING ENGINEER will be well informed on activities across the Atlantic.

Cost of Prints

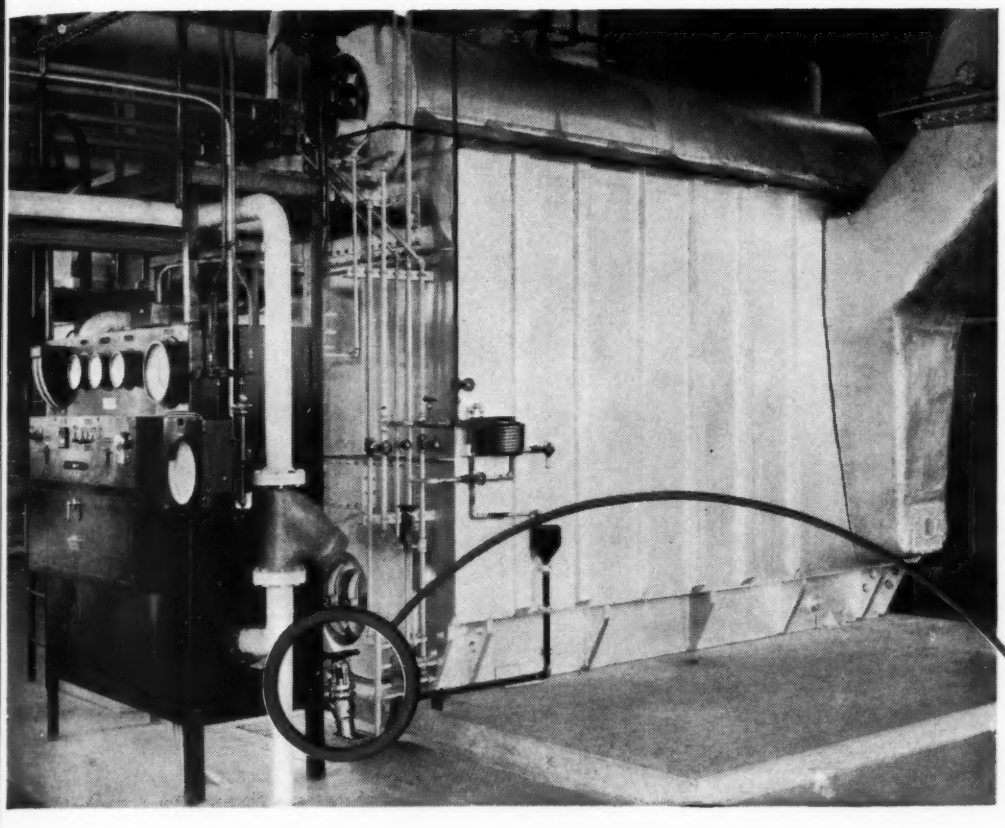
Back on the domestic scene, an article is now being prepared by the principals of a prominent Eastern consulting firm to show how a consultant determines the breakeven point between the cost of having prints done by an outside firm and operating his own reproduction equipment. If any readers have made cost comparisons within their own firms, the Editors would like to have a summary of the results to add to the information collected.

Casualty Insurance

The consulting engineer has to be an expert in a lot of subjects never touched upon in the institutions of higher engineering education. In advising his client the consultant is expected to understand casualty insurance and know how to specify the proper type and amount to cover any possible liability. Two experts, W. Seward Mariner, a consulting engineer, and E. B. Curtis, an insurance executive, give some good advice on this subject in an article in this issue, "Casualty Insurance Requirements."

Report from Europe

The Special Report in this issue covering the European Tour runs longer (10 pages) than originally had been planned, but there were so many aspects of interest and importance to American consultants that it was decided to give it the space needed for full coverage. Naturally, 30 days in Europe did not solve all the misunderstandings between European and U.S. consulting engineers, but a good beginning was made. Perhaps after a few more visits to Europe and some well planned tours of this country by European consultants, we will find that each group has much to add to the progress of the profession.



COMBUSTION ENGINEERING ADOPTS YARWAY SEATLESS BLOW-OFF VALVES FOR PACKAGE BOILERS

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Illustrations by Philip Reed

When Preparing Construction Contracts Be Sure to Cover . . .

Casualty Insurance Requirements

FORTY YEARS AGO the insurance requirements of a typical construction contract were as simple as, "The Contractor shall carry liability insurance with a satisfactory insurance company to cover all bodily injuries as above mentioned." In contrast, the insurance requirements of a recent construction contract filled over three, single-spaced, typewritten pages. Thus construction insurance coverage has become more complex. To serve his client properly, the engineer should have at least a general knowledge of the availability and purpose of the types of insurance coverage most commonly required in connection with construction contracts.

Construction operations often result in claims for damages on account of bodily injury or injury to property. Such claims may be made against the contractor, the owner, or both. Such claims require investigation and negotiation, and may result in litigation. If claim is made or suit is brought against the owner, he may be put to considerable expense at best and, at worst, he may face a costly judgment.

Most construction contracts attempt to shield the owner from such expense and loss by requiring that the contractor "defend, indemnify, and save harmless the owner against all loss or damage arising out of or in connection with the work specified in the contract." This is commonly known as the "indemnity" or "hold harmless" clause of the contract. Such a shield, however, may not be fully effective.

If the owner wishes to have more protection than the indemnity clause gives him, he may require the contractor to carry certain types of insurance coverage to protect the contractor, and indirectly, the owner, against liability for certain accidents. The coverage and limits should be specified in the documents so that the contractor may know definitely what insurance he must provide. Since the prices bid in a well-prepared proposal will include the contractor's insurance costs, and the owner ultimately will pay the premiums as part of the contract price, the contractor should be required to furnish only the insurance that will provide protection against the risks the owner is not willing to assume.

Decisions as to the nature and extent of such risks are primarily a matter of financial policy on the part of the owner rather than an engineering matter. Nevertheless, the owner's representatives will often look to the consultant for advice on this subject, and it is the engineer who will prepare the contract documents incorporating the insurance requirements. However, in developing the requirements with the owner, the consulting engineer should remember that it is the owner for whom he is providing ultimate protection; any benefit to the contractor, though possibly desirable, is incidental.

The Need for Insurance

Since most contracts place all liability on the contractor, and the bond guarantees fulfillment of the contractor's obligations, it would appear at first glance that there is no need to require the contractor to carry insurance. Lack of insurance, however, might be undesirable from the owner's viewpoint.

In the event of a claim against the owner, either jointly with the contractor or separately, the owner would at least have to investigate and negotiate; possibly he would have to face litigation and then pay damages if there were an adverse judgment. Most owners do not have a staff trained and experienced in such matters.

Although the contract places most of the burden for investigation on the contractor, he may be even less equipped to do it properly. Even if the owner were able to shift the entire burden of investigation, negotiation, litigation, and settlement to the contractor, a high judgment might still have serious results. The contractor's financial resources might be strained so that he would have difficulty in finishing the job, or would have to abandon it altogether. Then, the owner would finish the work, and the surety on the bond would be called in. On a small job, with low amount of bond, there might not be enough left from the bond to finish the job after the judgment was settled. Or, on the other hand, if the job were finished and the surety then were called on to settle the judgment, there might not be enough left from the amount of the bond to make settlement. Here, the court undoubtedly would bring final judgment against the owner.

Any situation that impedes successful completion of the work is undesirable, particularly if it goes so far as abandonment of the contract and completion of the work by the owner or the surety, not to mention settlement by the owner of judgments. It may be concluded, therefore, that suitable insurance coverage is a necessity in contract documents.

Trend of Damage Awards

The amounts awarded as damages in negligence cases appear to be ever increasing. In a bodily injury case involving disfigurement, permanent disability, or unusual personal suffering, a court will award substantial damages. In property damage cases, awards are likewise high, particularly if loss of use of the damaged property is involved. To illustrate, an insurance policy was recently issued to a contractor engaged in the demolition of a bridge. An un-

E. B. CURTIS

Mr. Curtis attended Brown University. He then went to work for the Liberty Mutual Insurance Company and spent eleven years with that firm in field offices followed by 14 years in the home office. He has personally handled the casualty insurance on a large volume of contracting business including some of the largest construction projects in the country. His present duties as Manager, Risk Underwriting, make him responsible for Liberty Mutual Insurance Company's risk underwriting results on a nationwide basis.

W. SEWARD MARINER

Mr. Mariner received his education at Williston Academy and the Harvard Engineering School. After several years in the field on construction work and as a safety engineer, he joined Metcalf & Eddy, in 1936, serving as assistant engineer, project engineer, and resident engineer. From January 1947 until April 1956, he was the head of their Specifications Department. Mr. Mariner recently moved to New London, N. H., where he now maintains his own office and engages in consulting work on construction specifications.

derwater telephone cable was within fifty feet of one of the abutments. The insurance company was told officially that in the event the cable was damaged to the extent that it was completely out of service, "loss of use" would come to $5000 per minute.

Adequacy of Protection

All insurance sales, claims, and underwriting personnel can quote examples of the serious results of not having insurance coverage of suitable type or sufficiently high limits.

A contractor entered into a contract to construct a paved parking area adjacent to a large store in a city of average size. He bought both bodily injury and property damage insurance, but as the job appeared to be relatively nonhazardous, he purchased low limits of liability. The bodily injury limits were $10,000 each person, subject to a total limit of $20,000 for all persons injured in any one accident. The property damage limit was $5000 for one accident, subject to a total limit of $25,000 for all accidents.

In putting in the drainage system, the contractor was required to dig a trench from the center of the parking area to the street. He used a mechanical excavator for this purpose. As the excavator approached the street, a gas main was hit, causing an explosion which carried into a nearby building. Three people were killed, and the building was partially demolished. Bodily injury and property damage claims from this accident exceeded $100,000.

Many contractors' operations create an "attractive nuisance," whereby their responsibility for preventing injury is greater in the case of children than for adults. A contractor was engaged in drilling a test well in a rural, sparsely wooded area—an operation and location hardly seeming to require much insurance protection. However, one week-end two adventurous boys managed to spill and ignite some of the contractor's gasoline. They were badly burned in the fire. The contractor was protected by adequate insurance—a great comfort to his peace of mind as well as his pocketbook.

The constantly increasing verdicts awarded in favor of the plaintiff in accident cases make it advisable that owners and contractors purchase adequate liability insurance.

Types of Coverage

Several types of casualty insurance are available to contractors and, under present-day conditions, they generally should be provided for adequate protection of the owner's interests.

Workmen's Compensation Insurance covers the liability of the contractor for injuries sustained by his employees in the course of their employment. Regardless of the fact that Workmen's Compensation Insurance usually is mandatory by law, the contract should require that the contractor furnish it; otherwise the owner might become responsible for the payment of the related premium.

Public Liability Insurance covers the liability of the contractor for bodily injury or property damage sustained by any person or persons, other than employees of the contractor, provided such injury or damage is caused by accident. Public liability insurance is rather a broad, general term and specifically covers the following hazards:

Premises Operations Hazard. This covers the contractor for accidents arising out of the contractor's own operations at the job site only during the period while such operations are actually in progress. Once the project is completed, this coverage ceases.

Contractor's Protective Hazard. This covers the contractor for his liability in connection with work performed for him by a subcontractor. It also covers the supervisory acts or omissions of the contractor in connection with work done by the subcontractor.

Completed Operations Hazard. This covers the contractor for accidents that occur after the job has been fully completed.

Contractual Liability Hazard. This covers the contractor for liability assumed by him under contract. Without this coverage his other insurance will protect him only against liability that is his under the law; for liability not his under the law but assumed by him under the contract, he will have no insurance protection. The owner, in turn, will lack protection.

Elevator Liability Hazard. This covers the contractor in connection with the existence and operation of his elevators or any type of hod and material hoists at the construction site.

Types of Policy

There are two types of public liability policies available today. The first is commonly known as a "Schedule General Liability Policy." Under this form any one or more of the aforementioned hazards can be insured. The second is known as a "Comprehensive General Liability Policy." Under this form all hazards must be insured except "Completed Operations" and "Contractual." Either or both of these hazards may be excluded or included.

Whether the Schedule form or the Comprehensive form should be required depends to a large degree on the extent and type of work to be performed. If all the hazards are insured under the Schedule form, then there is little difference in insurance protection between the Schedule and Comprehensive policies. If the project does not include certain hazards, such as "Elevator" or "Completed Operations," then the Schedule form of policy is satisfactory.

Exclusions

While both Schedule and Comprehensive policies contain many exclusions, there are exclusions related only to property damage insurance that should

be mentioned. Coverage generally is excluded for liability resulting from:

¶ Blasting or explosion.

¶ Injury to underground wires, pipes, conduits, and similar property and appurtenant apparatus.

¶ Collapse of or structural injury to any building or structure due to excavation, pile driving, shoring, or underpinning.

These exclusions may be deleted and coverage afforded for an additional premium. The hazards should be considered carefully, and suitable coverage should be required.

Automobile Liability

Automobile liability covers the liability of the contractor for bodily injury or property damage sustained by any person or persons, resulting from the ownership, maintenance, or use of automobiles:

¶ Owned by the contractor.

¶ Hired by the contractor.

¶ Owned by employees of the contractor and used in the business of the contractor.

Insurance may be purchased for any one or more of these types of automobile exposure. It usually will be desirable to require all three types.

Railroad Coverage

If the project involves work within a railroad right of way, Railroad Protective Insurance, possibly with very high limits, usually will be required by the railroad. The railroad also will have certain requirements relative to their receiving copies of the policies and other evidence of coverage.

Limits

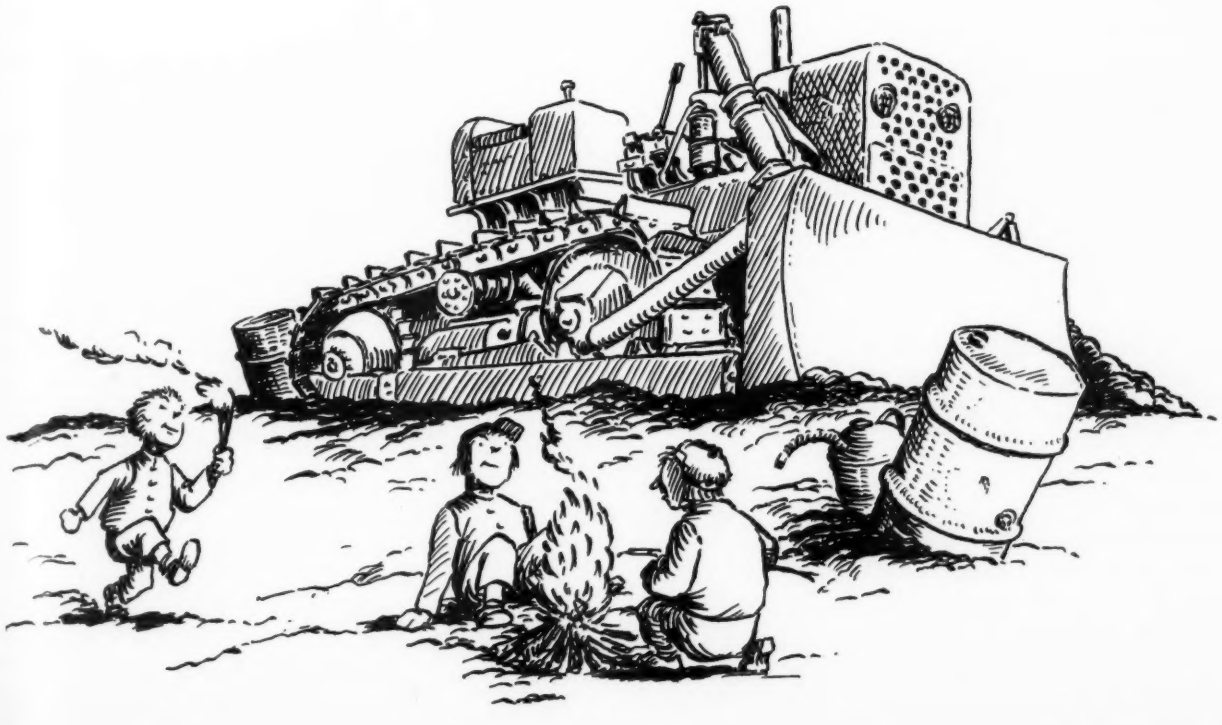
Bodily injury limits of liability should not be geared down to the size of the job, as there is no direct relationship. In view of the generosity of juries in awarding damages in accident cases, limits should be set amply high. The premium increases very slowly in proportion to the increase in limits. Limits should not be less than $50,000/$100,000.

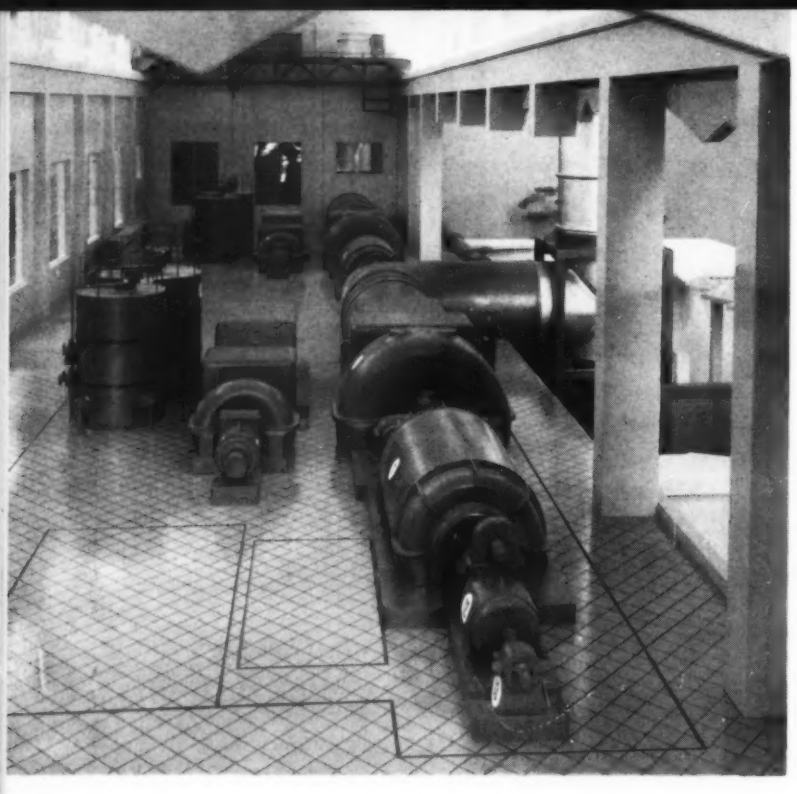
Limits on property damage, to a certain extent, may be geared to the job, but should be ample.

Certificates

To ensure that the required insurance is being provided, the engineer supervising the work should insist on receiving from the insurance company insuring the contractor, certificates giving policy numbers, limits, expiration dates, and any special provisions related to the various coverages furnished. These certificates also should show, by suitable references to the particular contract and each type of coverage mentioned, the correlation between the insurance furnished and that required. Certificates also should provide for notice to the owner in event of cancellation or restrictive amendment.

These certificates should be scrutinized carefully. If there is any doubt as to fulfillment of the requirements, further inquiry is in order and, not infrequently, justified. ▲▲





MODEL OF A NEW 50,000 KW GAS TURBINE POWER STATION FOR ITALY. EQUIPMENT FROM LEFT TO RIGHT INCLUDES: SWITCHBOARDS (ALONG WALL); TWO COMBUSTION CHAMBERS PER UNIT; THE HIGH PRESSURE SETS; AND THE LOW PRESSURE SETS, CONSISTING OF LOW PRESSURE COMPRESSORS, LOW PRESSURE GAS TURBINES, GENERATORS, AND NECESSARY EXHAUST PIPING.

H. PFENNINGER, Dipl. Ing.
Brown, Boveri & Company Limited

The Economics of Covering Peak Loads With

Gas Turbines in Electric Utility Plants

IN RECENT YEARS, the gas turbine has established its position as a prime mover despite objections in various quarters. A few years ago, this newly developed prime mover was not regarded by many responsible engineers as a reliable piece of equipment. Now, however, the gas turbine has come through its trial period so well that it has earned its position as a reliable and extremely economical machine.

In my opinion, the most useful range of output for gas turbines now lies between 1000 kw and approximately 25,000 kw per unit. With further engineering development, this output range will be extended both upward and downward. Today, the smaller outputs are better handled by diesel engines, and the larger by the normal steam power station. And there are special fields where both one or the other prime mover oversteps these somewhat summarized limits. For example, the back-pressure steam turbine is the most economical unit and is preferred to other prime movers for any application where process steam is required in addition to electrical energy, as in textile and paper mills, and in the chemical industry.

Even here the gas turbine is beginning to show possibilities. The relatively large volume of exhaust gases and high exhaust temperature of the turbine, as well as the oxygen content of the gases (approximately 16 to 18 percent oxygen as compared to approximately 2.5 percent in a steam boiler plant), permit using the exhaust gases; thus, the gas turbine has, in special instances, advantages over the steam turbine in industrial power plants. A gas turbine plant with an exhaust heated boiler in series, without an auxiliary burner, generates about 0.18 kwh per lb of steam whereas a back-pressure turbine only can supply 0.045 kwh per lb of steam. Where a high ratio of electrical output to steam quantity is required (and therefore an extraction back-pressure turbine must be used instead of a back-pressure turbine), the fuel consumption of a gas turbine with a waste heat boiler is less than that of the conventional steam plant. However, one of the most useful possibilities for application of the gas turbine is in covering peak loads in the electric utility field.

Economic Considerations

The continued increase in power consumption in all countries has intensified the problem of supplying the load peaks. In Italy, Austria, Sweden, Norway, and Switzerland, for example, the major portion of electrical energy is produced in hydro-electric plants. The flow of rivers is, however, very dependent on season and weather. Unfortunately, pow-

er consumption reaches its peak just at the time of the year when the volume of water flowing in the rivers is at its lowest.

Attempts have been made to overcome this undesirable condition by providing so-called "storage power plants." These have been only partially successful because the filling of the storage reservoirs is also dependent upon weather conditions. In dry years, the flow of mountain streams is so low that it is impossible to fill the storage reservoirs. After a succession of a few dry years, this can lead to a serious shortage of electrical energy. Since these storage plants are very costly, it is not economical to construct additional plants of this kind to compensate for the shortage of energy occurring once every few years. Much too great a part of the cost of the installation must be charged to capital expenses.

In countries where capital is hard to find, long write-offs of investments are undesirable. There is, therefore, a great demand for a power plant that requires a small initial outlay and can be written off quickly in spite of its being in service for only a short part of the year.

Characteristics of Utility Loads

The problem is made still more difficult by the fact that advances in the standard of living tend to increase the peak type of loading of power stations. The increased consumption of energy in homes gives rise to short daily peaks between 4:00 and 6:00 p.m. This gives a peak load for about 700 hours a year. Because of electric heating in the spring and fall, seasonal peaks occur earlier or later, and for longer or shorter periods, according to the weather.

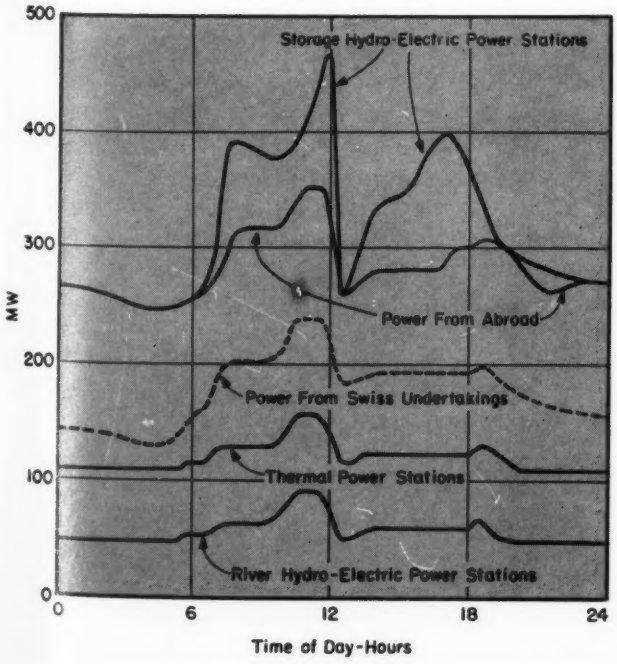


FIG. 1—CHART OF TOTAL LOAD OF THE NORTH EAST SWITZERLAND POWER HOUSES (NOK) ON JAN. 5, 1954.

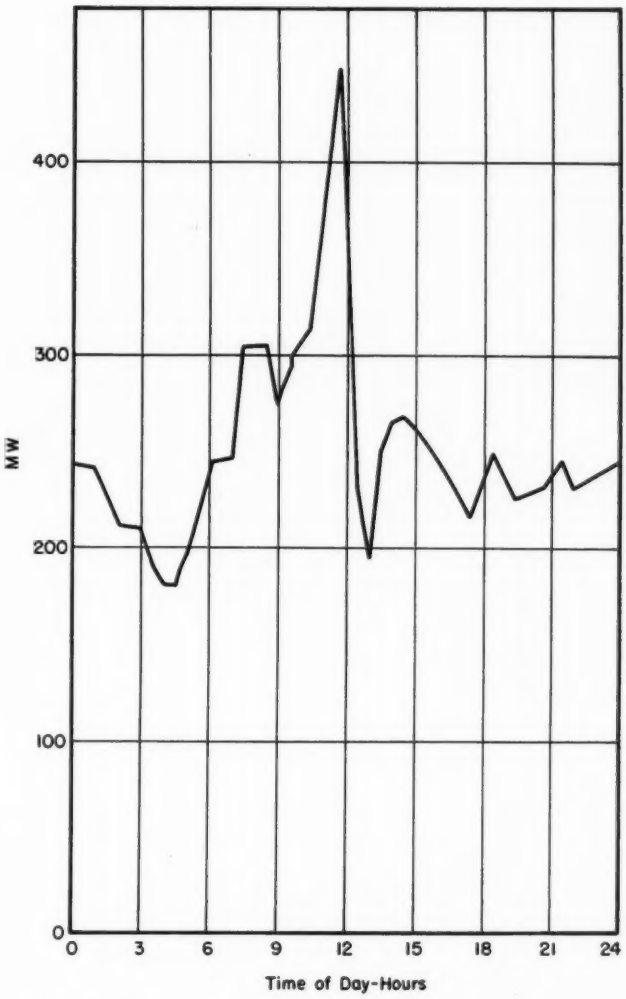


FIG. 2—TOTAL LOAD OF THE NOK ON AUG. 18, 1954.

In the United States, in the south and southwest, definite summer day peaks occur because of the increased use of air-conditioning. These last about 6 hours daily, for about 2 or 3 months, which would load the peak coverage plants for about 360 to 540 hours a year.

Load variations within the supply area of the largest Swiss electric utility, the North East Switzerland Electricity Works (NOK) will further illustrate the problems. Fig. 1 shows the variation of the total load on January 5, 1954 (Tuesday). The flow in the rivers was relatively small at that time. The river plants, therefore, were applied only to cover 18 percent of the demand; the thermal power stations supplied about 20 percent. A large part of the energy had to be obtained from other companies. The storage plants only were called upon to supply energy during the day and evening peaks. Worthy of note is the large increase of energy consumption between 10 am and 12 noon. This comes from household loads.

For the sake of comparison also consider the total load of this company on a summer's day. Fig. 2 shows the variation on August 18, 1954. The maximum load at 11:40 am is almost as high as in winter. It is, however, much more prominent because the current con-

COMPARISON OF THE PRIME COSTS OF ENERGY PRODUCED IN GAS TURBINE AND STEAM TURBINE PLANTS

	Gas Turbine Plant without preheater	*Gas Turbine Plant with preheater*	*Steam Plant for peak load*	*Modern Steam Plant for base load*
Size of Plant				
Terminal output, kw	4—25,000 kw units	4—25,000 kw units	2—50,000 kw units	1—100,000 kw unit
Investment,[1] dollars per kw	86	115	103	120
Technical Data				
Gas inlet temperature, degrees F	1200	1200	—	—
Live steam pressure, psig	—	—	1250	1650
Live steam temperature, degrees F	—	—	950	1000
Reheat steam temperature, degrees F	—	—	—	1000
Fuel	natural gas	natural gas	natural gas	natural gas
Fuel Cost, cents per million Btu	15	15	15	15
Gross calorific value of fuel, Btu per cu ft	1100	1100	1100	1100
Over-all thermal efficiency, percent	21.2	28.2	28.8	33.0
Net specific heat rate, Btu per kwh	16,100	12,100	11,850	10,340
Running Costs				
Fuel, mills per net kwh	2.41	1.81	1.77	1.55
Water and lubrication, mills per net kwh	0.03	0.03	0.10	0.10
Maintenance, mills per net kwh	0.08	0.10	0.15	0.17
Total running cost, mills per net kwh	2.52	1.94	2.02	1.82
Annual Fixed Charges				
Labor costs, dollars per kw	0.75	0.90	2.50	2.80
Capital charges,[2] dollars per kw	11.60	15.55	13.90	16.20
Total fixed charges, dollars per kw	12.35	16.45	16.40	19.00
Total Prime Cost of Energy				
Annual running time, hours	2000 8760	2000 8760	2000 8760	2000 8760
Total running cost, mills per kwh	2.52 2.52	1.94 1.94	2.02 2.02	1.82 1.82
Total fixed charges, mills per kwh	6.17 1.41	8.22 1.88	8.20 1.87	9.50 2.17
Total prime cost of energy, mills per kwh	8.69 3.93	10.16 3.82	10.22 3.89	11.32 3.99

[1] Investment values cover the complete installation including acquisition of land, buildings, railroad sidings, transformers and switchgear, civil engineering, supervision, etc.

[2] Fixed capital charges include interest, depreciation, taxes on capital, fixed maintenance charges, insurance, etc.

sumption during the rest of the day is lower. The short diminution at 9 am, which comes from the 9 o'clock interval in factories, can be plainly seen.

Similar conditions occur in many localities. Lighting of large towns (street lighting, lighted billboards, etc.) also causes increased consumption for several hours. In winter there is an accumulation of load because work in factories, stores, and offices is still in progress when street lighting must be switched on. Even in countries where the major part of electrical energy is produced by heat machines—particularly large steam power stations—the problem of covering the load peaks is not easy to solve.

Steam Plant Problems

Large, modern, high efficiency power stations must be designed for high steam pressures and temperatures. Such plants cannot be shut down for short periods without trouble, for the thick-walled piping, the heavy turbine cylinders, and the rotors with their long slender glands cannot be subjected to sudden temperature changes without damage. Attempts are made to overcome these difficulties by keeping the boilers under steam and the turbines warm during the stand-by periods or even by rotating the turbine and generator by power taken from outside. All this, however, entails additional fuel costs and personnel.

These considerations lead to the conclusion that the most efficient steam plants should be used for the basic load only. Prime movers for peak loads, on the other hand, should have the following properties.

¶ Small initial capital outlay for the prime mover.

¶ Small space requirements both in ground area and volume, to keep the building small and to enable the plant to be located at the load center.

¶ Minimum maintenance when shut down.

¶ Quickly ready for service and short starting time from cold to full load.

¶ Minimum personnel, since it is not feasible to pay operators merely for the short operating time.

¶ Simple operation, for personnel operating equipment only at intervals get out of practice.

¶ Possibility of choosing low first cost even with high fuel consumption where that combination is most economical because of the few hours of operation.

The gas turbine has these features to a far greater degree than other prime movers. It also has the advantage of low fuel consumption for starting up and low water requirements, so that it can be installed at the load center—even in the center of cities. This

also avoids the need for additional transmission lines that otherwise would be required to carry the increased, temporary load. In contrast to storage plants, these power stations can be constructed quickly.

Economic Calculations

Let us assume that we need a storage power station with an output of 100,000 kw, running at full load for about 2000 hours per year. We will first compare, in tabular form, four possible solutions. One uses four gas turbines without preheaters; another uses four gas turbines with preheaters. A third involves a steam power station designed as a conservative plant for peak load operation, and the fourth deals with a modern steam power station with high thermal efficiency.

The table shows the installation costs, the various operating costs, and finally, the total costs of energy production. It can be seen that with a yearly running time of 2000 hours, the gas turbine plant without preheaters (the plant with the lowest installation cost and the greatest calorific consumption) gives the lowest energy cost. When, as in this example, the price of fuel is low, it does not pay to reduce the fuel costs by larger capital outlay. The modern steam power plant, with a heat rate 35 percent better than that of the gas turbine plant, has a 30 percent higher first cost. Even the cheaper, conservative steam plant has a first cost that is still 18 percent higher.

In the table we also have entered the prime costs of energy for a yearly running time of 8760 hours (continuous service). It is interesting to note that with the data assumed in the table for the price of fuel and cost of raising capital, the modern steam power station does not match the gas turbine even in continuous service.

Graphical Analysis

A better picture is obtained from a graphical comparison. As is well known, the prime energy costs of a power plant are composed of the fixed or capital costs (including the costs for raising capital) and the variable costs, which we will call operating costs. The fixed costs are independent of the yearly running time. They consist of the interest on the capital costs, the depreciation charges, insurance, the taxes on capital, and those maintenance costs that are independent of the running time. To these must be added the labor costs, insofar as operating personnel cannot be otherwise employed during shut down periods. To the fixed costs, moreover, may be added rent agreements and other similar costs.

The operating costs are a function of the number of operating hours, the frequency of starts, and the loading of the equipment. They consist of the expenditures for fuel, lubricating oil, water, and maintenance of the turbines and related equipment.

Let us now study these relationships with the help of simple examples:

Insofar as fixed costs are concerned, let:

A = Total investment in dollars per kw

KA = Depreciation, interest, taxes on capital, water rights, and fixed maintenance costs in dollars per kw per year

S = Annual labor costs in dollars per kw

Where operating costs are concerned, let:

B= Expenditure on fuel in dollars per kwh

X = Expenditure on lubricating oil in dollars per kwh

J = Expenditure on water in dollars per kwh

Z = Expenditure on maintenance in dollars per kwh

Further, let h be the number of operating hours annually, and e the total prime cost of energy in dollars per kwh.

Using these symbols, we have:

$$e = \frac{KA + S}{h} + B + X + J + Z \qquad (1)$$

If we let C equal B + X + J + Z, then,

$$e = \frac{KA + S}{h} + C \qquad (2)$$

To find the most economical conditions for this

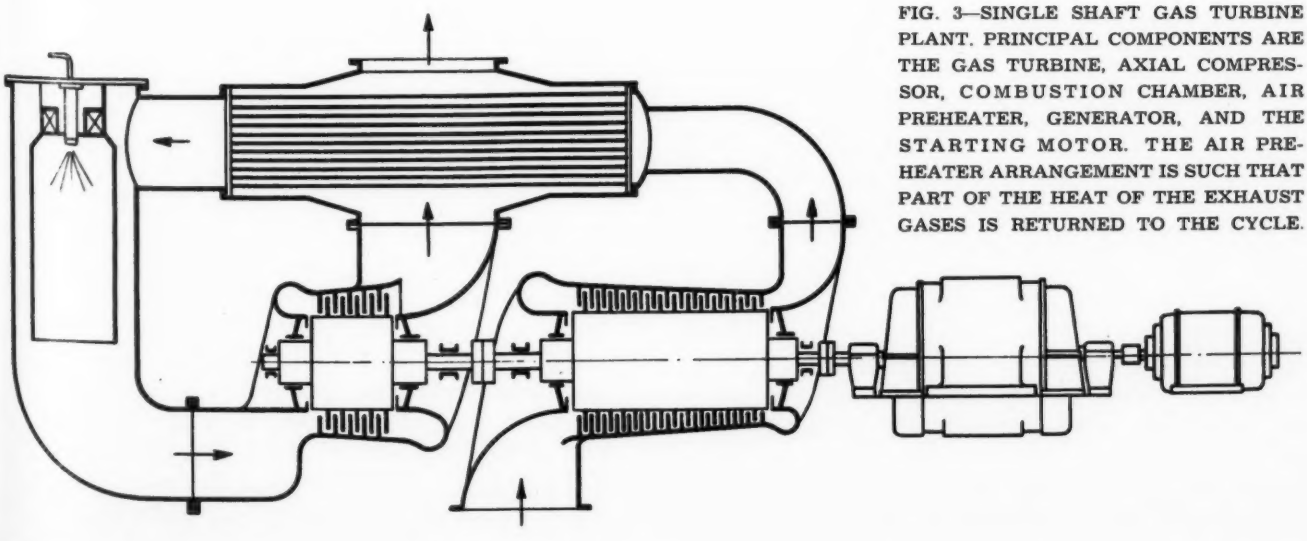


FIG. 3—SINGLE SHAFT GAS TURBINE PLANT. PRINCIPAL COMPONENTS ARE THE GAS TURBINE, AXIAL COMPRESSOR, COMBUSTION CHAMBER, AIR PREHEATER, GENERATOR, AND THE STARTING MOTOR. THE AIR PREHEATER ARRANGEMENT IS SUCH THAT PART OF THE HEAT OF THE EXHAUST GASES IS RETURNED TO THE CYCLE.

equation, we must equate its derivative to zero. Then,

$$h = -\frac{KdA + dS}{dC} \qquad (3)$$

In order to compare various plants with each other, it is convenient to plot operating costs against fixed capital charges plus annual renumeration of staff. The number of operating hours annually at which two different plants give the same prime cost of energy can be determined in accordance with expression (3), by the angle between the straight line plotted and the abscissa.

$$\frac{KdA + dS}{dC} = -\tan \alpha \qquad (4)$$

Therefore a set of straight lines with the angles of inclination α, α', α'' . . . corresponds to the yearly number of running hours h, h′, h″ . . .

If the values for the various plants considered lie on a curve in the diagram, the value for the most economical plant at a given number of running hours h is obtained by shifting the straight line corresponding to h until it touches the curve in one point only, becoming tangent to it. Let us follow such a calculation of the economy of an installation.

Example of the Method

A simple gas turbine plant consists of the elements shown in Fig. 3. If a plant is desired to be as low cost as possible, the air preheater is dispensed with (resulting in a poorer thermal efficiency). On the other hand, the larger the air preheater, the smaller the heat losses in the exhaust gases and, therefore, the higher the thermal efficiency. The plant, however, becomes costly on account of the increased size of the air preheater.

We will define the size of the air preheater by the utilization factor E.

$$E = \frac{t_{2L} - t_{1L}}{t_{1g} - t_{1L}} \qquad (5)$$

in which the values to which the temperatures apply are as shown in Fig. 4. In order to obtain a clear picture, let us consider the following three plants:

¶ A gas turbine plant without air preheater.

¶ A gas turbine plant equipped with all piping, foundations, etc. for an air preheater in which the heat exchanging area is zero (E = 0). This plant naturally will never be built; it merely represents the end point of the curve of air preheaters with different heat-exchanging areas.

¶ Gas turbine plants with air preheaters with increasing values of E.

Fig. 5 shows the results. The abscissae represent the operating costs and the ordinates the yearly fixed charges of a complete plant including acquisition of land, buildings, railway sidings, fuel storage, switchgear, transformers, and connections to outgoing transmission lines. In addition, from expression (4), the family of straight lines can be drawn corresponding to various numbers of running hours. Price of fuel, operating costs, cost of raising capital, and labor costs are in accordance with the values in the table.

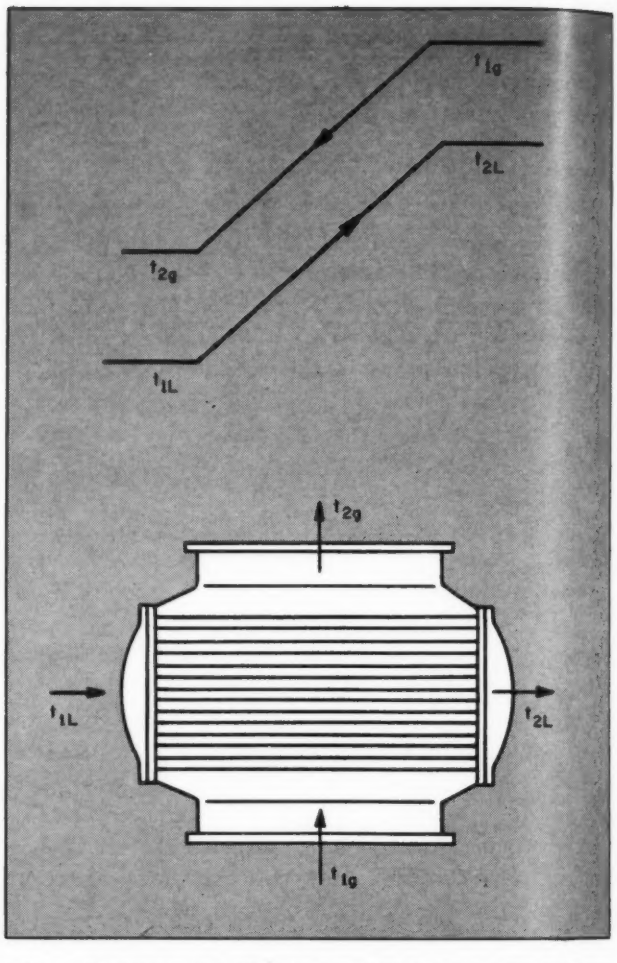


FIG. 4—DIAGRAM OF THE AIR PREHEATER. TEMPERATURE SYMBOLS INCLUDE: t_{1L} = INLET AIR; t_{2L} = OUTLET AIR; t_{1g} = EXHAUST GAS ON ENTERING THE AIR PREHEATER; t_{2g} = EXHAUST GAS ON LEAVING THE AIR PREHEATER.

The tangent to the curve through the point that represents the plant without preheater shows that for a yearly number of operating hours less than 6700, the plant without air preheater is more economical than all plants with air preheaters up to a value of E = 0.72. It would not, therefore, pay to build a plant with an air preheater if the utilization factor E is less than 0.72. Moreover, it can be seen that plants that run continuously (h = 8760) become uneconomical when the utilization factor of the air preheater E is greater than 0.75, since the installation costs rise too quickly with respect to the decrease in the running costs.

If it is desired to ascertain the most economical plant for a selected yearly number of operating hours, it will be found at the place where the straight line corresponding to the required number of running hours h makes a tangent with the curve.

From Fig. 5, therefore, the following conclusions with respect to economy can be drawn:

¶ Gas turbine plants in which the factor of utiliza-

tion of the air preheater E is less than 0.72 are not economical. A plant without preheater, on account of its low price of acquisition, gives a lower prime cost of energy.

¶ Gas turbine plants in which the factor of utilization of the air preheater E is greater than 0.75 are not economical (for the assumed fuel price) because the installation price is too high.

¶ With operating hours per year between 7500 and 8760, gas turbine plants should be chosen that have a utilization factor E of the air preheater between 0.72 and 0.75.

Now compare these different gas turbine plants with the steam turbine plants shown in the table. For this purpose we have plotted the values of the steam plants in the diagram of Fig. 5. It can be seen that for the special conditions of low fuel-oil price, the steam plant for peak loads is only superior to the gas turbine without preheaters when the operating time per year is greater than 8100 hours. It can further be seen that it is always possible to build a gas turbine plant that is more economical than a steam plant. A gas turbine plant with the same fixed charges as a steam plant shows lower operating costs. A comparison of the two steam plants shows that the more efficient steam plant for base loads, with higher fixed charges and lower operating costs, would be superior only if the yearly operating hours were about 13,000—an impossible condition. It should be pointed out again that these comparisons hold only with the assumptions made as to price of fuel and cost of capital.

In countries in which the steam plant can consume very cheap home-produced coal, different results are obtained, since the gas turbine is not yet in a position to run on coal.

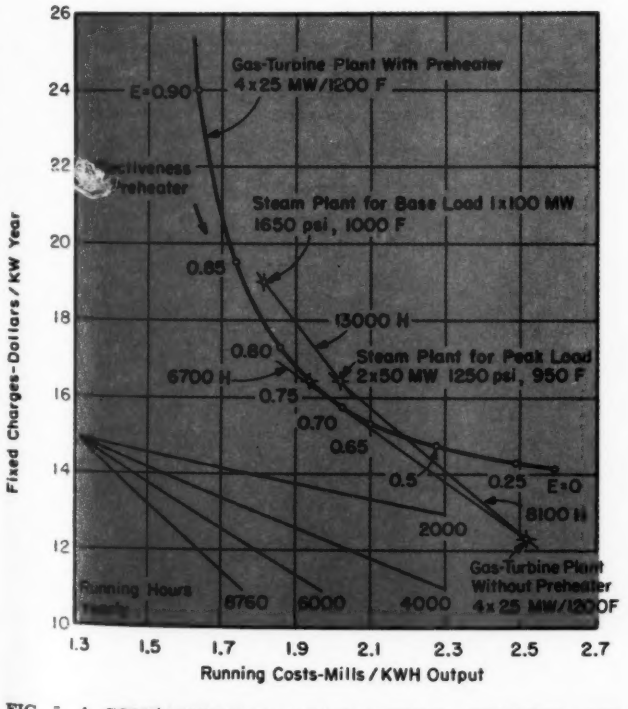


FIG. 5—A COMPARISON OF YEARLY FIXED CHARGES AND RUNNING COSTS OF: A GAS TURBINE PLANT WITHOUT AIR PREHEATER; GAS TURBINE PLANTS WITH AIR PREHEATERS OF DIFFERENT EFFECTIVENESS E (DIFFERENT FACTORS OF UTILIZATION); CONSERVATIVE STEAM TURBINE PLANT FOR PEAK LOADS; AND MODERN BASE LOAD STEAM PLANT.

Algebraic Comparison

It is, however, possible to compare different power plants purely algebraically without it being necessary to make use of the graphical representation. Let it be required to find the number of operating hours per year of two different plants at which the resulting prime energy costs will be the same. For this purpose let us modify equation (3). Then the limiting value of the number of running hours is:

$$h_{lim} = -\left(\frac{K\triangle A + \triangle S}{\triangle C}\right)1000 \qquad (6)$$

where A and S are in dollars and C is in mills.

This equation states that if we compare a plant with annual fixed costs KA, annual labor costs S, and operating costs C with another plant in which the annual fixed costs are K′A′, the annual labor costs S′, and the operating costs C′, the annual operating hours h at which both plants are equally economical are obtained from the following expression:

$$h_{lim} = -\left(\frac{(KA + S) - (K'A' + S')}{C - C'}\right)1000 \quad (7)$$

Analysis of the expression proves that below the value obtained of h, the plant with the lower annual standing costs is more economical, above this value, the one with the higher annual fixed costs is to be preferred. If the value of h becomes negative, the more costly plant is eliminated. When the denominator is equal to zero, the value obtained for h is infinity, which indicates that the more costly plant is uneconomical over the whole operational range. If, on the other hand, when the numerator equals zero, the whole expression equals zero. Then, the plant with the higher operating costs does not pay even with the smallest possible number of operating hours.

As an example, take the gas turbine plant without preheater and the peak load steam plant. This gives:

$$h_{lim} = -\left(\frac{12.35 - 16.4}{2.52 - 2.02}\right)1000 = +8100$$

This implies that the steam plant is only more economical at yearly operating hours exceeding 8100. Below this value the gas turbine plant has lower total prime costs.

As a further example let us compare the same gas turbine plant with the base load steam plant. Here we obtain:

$$h_{lim} = -\left(\frac{12.35 - 19.00}{2.52 - 1.82}\right)1000 = +9500$$

This shows that the total prime energy costs of the base load steam plant are higher over the whole op-

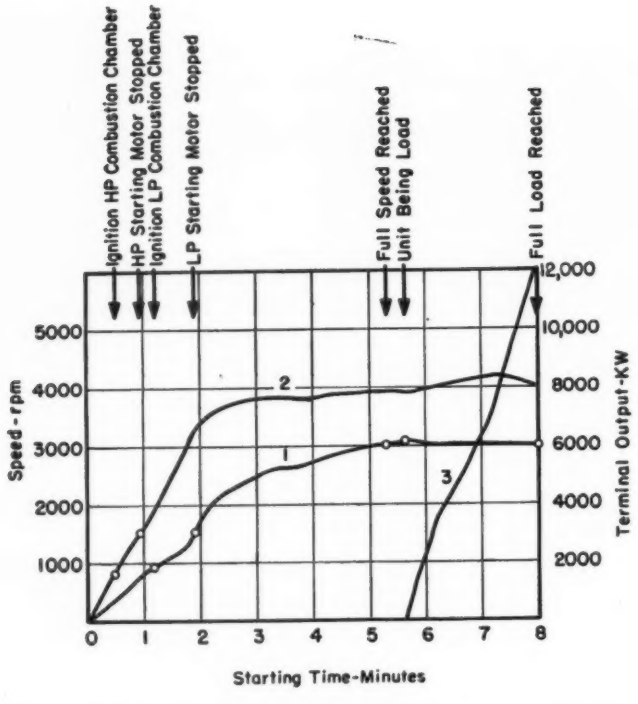


FIG. 6—STARTING DIAGRAM OF TWO STAGE GAS TURBINE WITHOUT PREHEATER. TIME TO FULL LOAD IS 8 MINUTES.

erational range. It is also of interest to note that of the total annual capital charges of this steam plant of $19.00 per kw per year, the labor costs amount to $2.80 per kw per year. The labor costs, therefore, have a considerable influence on the fixed costs; they amount to not less than 15 percent of the capital costs. From these comparative calculations it is seen that the low cost gas turbine plant represents, despite its relatively low thermal efficiency, the most economical plant for peak load power stations.

Advantages of Gas Turbine Plants

Let us now examine the advantages in the light of a few results obtained in actual practice. The short time for starting up and putting under load can be seen in Fig. 6. This shows the starting up procedure of a gas turbine plant with an output at the terminals of 12,000 kw. Starting from cold, the machine was under full load in 8 minutes.

The relatively small fuel consumption during the starting up period is a further advantage of the gas turbine. Fig. 7 shows the mean fuel consumption as a function of the number of hours run and the number of starts per day. If, for example, the machine is kept in service for 5 hours in the morning and 5 hours in the evening, the mean fuel consumption per kwh, including starting up and shutting down, increases only 2 percent as compared with continuous service.

Another advantage is physical size. The space requirements of a 25,000 kw plant only amount to 0.086 sq ft per kw. It also is worth mentioning that the requirements in cooling water for such a power station amount to only 600 cfm whereas a steam power station of the same output needs about 3600 cfm.

At the present time there are 17 units with terminal outputs between 20,000 and 30,000 kw under construction at the Brown Boveri works:

¶ Two units for the Societa Elettrica Selt Valdarno power station "Livorno," in Italy. (See photo).

¶ One unit for the Societa Romana di Elettricita Romana, in Rome, Italy.

¶ One unit for the power station Oerebro in Sweden.

¶ One unit for C. A. La Electricidad de Caracas, for the power station "El Convento," in Venezuela.

¶ Two units for the City of Edmonton, Canada.

¶ One unit for the Montreal Engineering Co., Montreal, Canada, for installation at Joarcam.

¶ Four units for the British Columbia Electric Company, for service at Vancouver.

¶ One unit for Bataaf'sche Petroleum Maatschappij den Haag, Netherland, for service at Las Morochas.

¶ One unit for the City of Medicine Hat, Canada.

¶ One unit for the Puerto Rico Water Resources Authority, San Juan, for installation at Mayaguez.

¶ Two units for Neue Oesterreichische Brown Boveri A. G., Wien, Austria.

In conclusion, it can be stated that for prominent load peaks of short duration, the gas turbine offers a very economical solution. When fuel prices are low, even for continuous operating time, the gas turbine gives the most economical installation, because it does not pay to install an expensive power station since the capital costs would influence the prime energy costs more than the low fuel oil costs. Here is an instance in which the gas turbine would be the logical peak load source of energy. This is the type of application for which the consulting engineer should specify a gas turbine. ▲▲

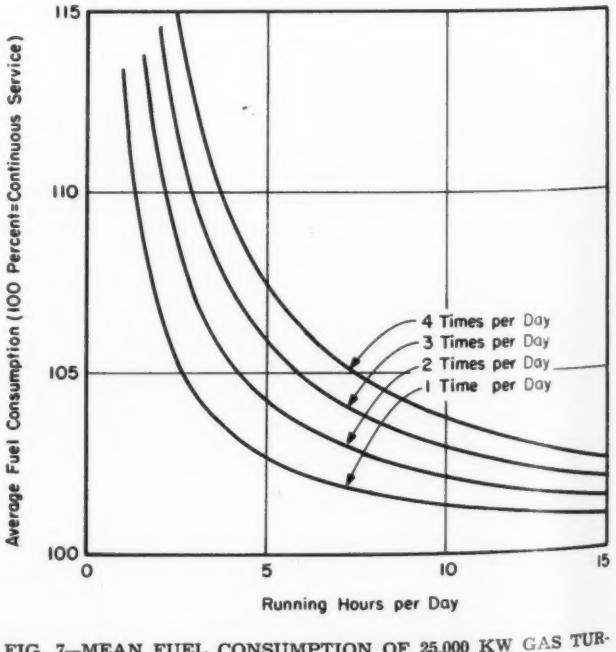


FIG. 7—MEAN FUEL CONSUMPTION OF 25,000 KW GAS TURBINE, BASED ON THE RUNNING TIME AND STARTS PER DAY.

PROJECT SITE AT 45TH AND AVE. OF AMERICAS.

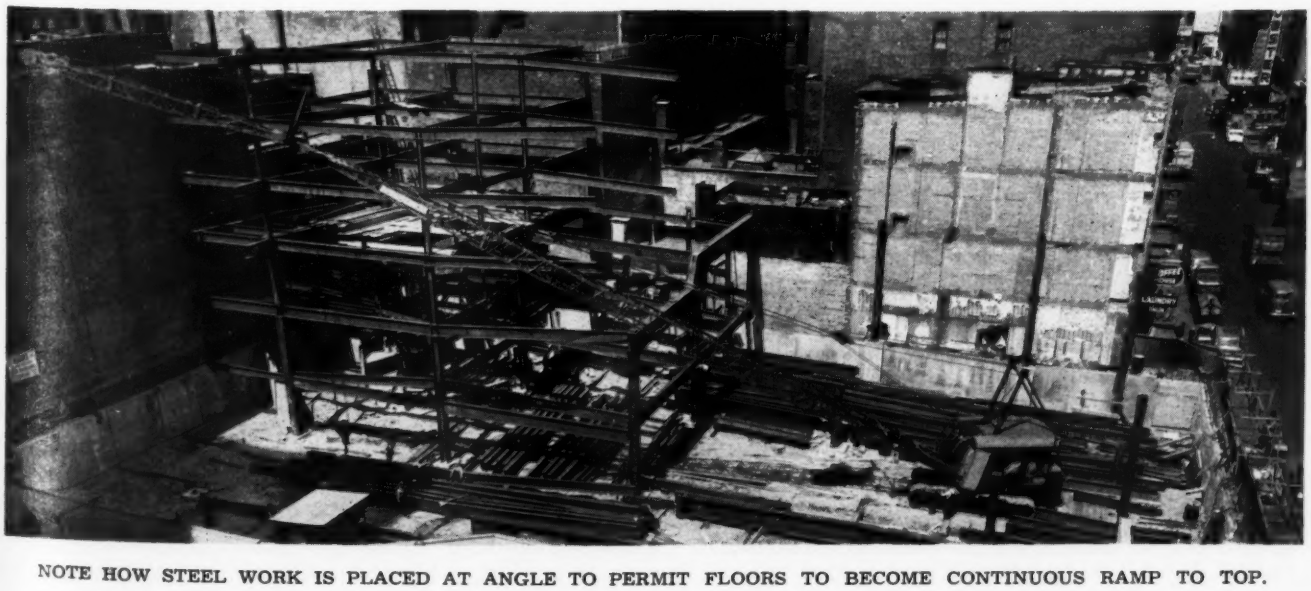
FIRST STEEL WORK WENT INTO PLACE IN MAY, 1955.

Design of Midtown Parking Structures

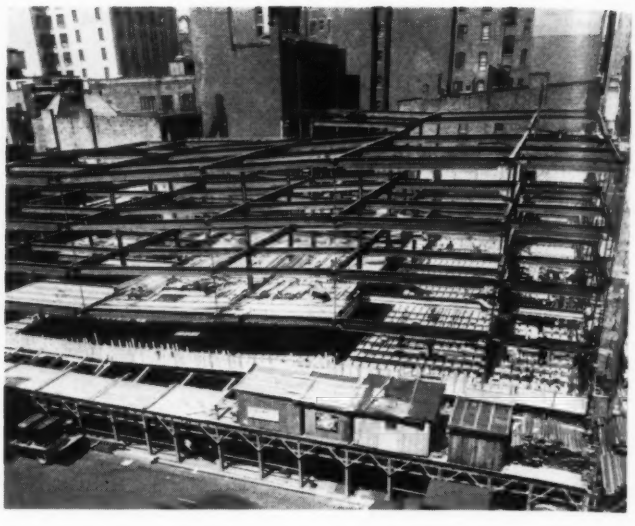
CHARLES N. WHINSTON, Charles N. & Selig Whinston
Architects—Engineers, New York City

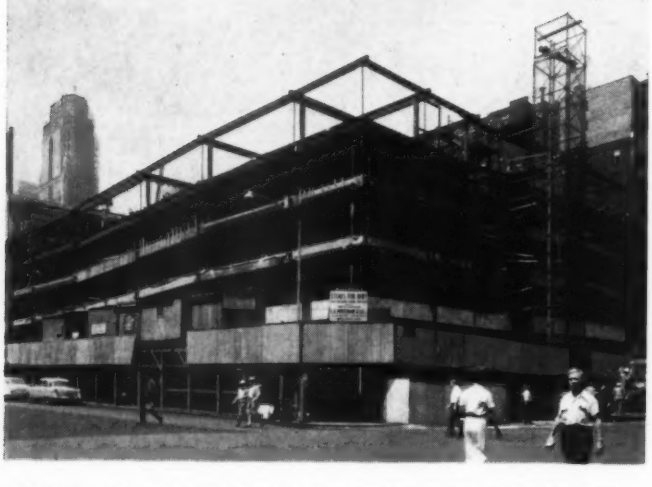
Charles N. Whinston graduated from Cooper Union, in 1911, with a degree of Bachelor of Engineering, and from Polytechnic Institute of Brooklyn, in 1913, with a degree of Civil Engineer. Since 1916, he has been engaged in the architectural and mechanical design and construction of buildings and structures. During World War II, his work also included the design of water purification systems, high speed automatic machinery, airplane pilot trainers, and electro-mechanical devices. Whinston is a Registered Architect in New York and New Jersey, and a Licensed Professional Engineer, in New York.

WHEN THE PRESENT zoning laws for New York City were enacted some 40 years ago, garages and parking structures were considered anathema, and they were relegated to the water fronts and other undesirable and unrestricted districts. That the water fronts



NOTE HOW STEEL WORK IS PLACED AT ANGLE TO PERMIT FLOORS TO BECOME CONTINUOUS RAMP TO TOP.





CONSTRUCTION PHOTOGRAPHS SHOW PROGRESS OF THE PARKING STRUCTURE FROM MAY THROUGH AUGUST 1955. THE CONTINUOUSLY SLOPING FLOORS MAKE USE OF A TWO-WAY, REINFORCED CONCRETE, LONG SPAN SYSTEM, THUS ELIMINATING FILLING-IN BEAMS. EXPENSIVE MIDTOWN LOCATION DEMANDED COMMERCIAL FRONTAGE.

were really desirable and ultimately would be developed never occurred to the experts.

In recent years thoughts on parking have reversed so that now parking facilities are legally demanded in new multiple dwellings, are encouraged in new business buildings, and are permitted on vacant properties in the very best locations.

Economic Considerations

The greatest demand for parking occurs in the midtown areas. Since land values are highest in these areas, the creation of parking facilities poses a problem in economics.

With midtown land values as high as $100 per sq ft and construction cost around $7 per sq ft, for a seven-level structure, this would come to about $14 for land plus $7 for building or a total of $21 per sq ft. Since the speculative builder would demand about 1/7 of this cost for himself, we have a demand charge of $3 per sq ft of structure.

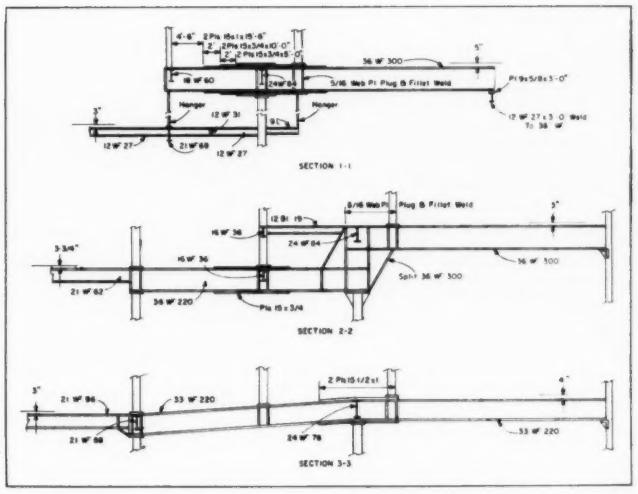
Annual midtown parking rentals have gone to as high as $2 per sq ft, but no higher, so that on the face of it, the midtown parking structure cannot be made to pay. Even with a rental charge of $2 per sq ft per year, the average car space (250 sq ft) must bring in $500 per year, or $1.37 per day. This means that for the operator to make a profit, it would be necessary to have an average daily parking fee of $2.00 per space throughout the entire year. This can be attained only in the most congested districts and with space turnover, making possible operation at over 100 percent of theoretical capacity. Even this does not make the structure a profitable investment. Midtown parking, therefore, requires supplemental income, and this only can be obtained from store rentals on the main frontage of the building.

Garage in Midtown Manhattan

All of these economic factors had to be considered when designing the new building at the corner of the Avenue of the Americas and 45th Street. This is in the heart of the theatrical district of New York City, near Times Square. The property fronts 150 feet along the Avenue and 100 feet along 45th Street and

covers all of the block front on the Avenue except for 50 feet at the south end.

The Avenue of the Americas is still a two-way street although most of the avenues already have been made one-way. West 45th Street is a one-way, west-bound street and West 44th Street is for east-bound traffic only. For ease of ingress and egress (especially since the City Planning Commission would not permit a driveway on the Avenue) both a 44th Street frontage as well as a 45th Street frontage would have been desirable. Since the 44th Street property could not be obtained at the time, it was decided to proceed with the 45th Street corner at once and make all structural provisions for the 44th Street outlet in the future. The 45th Street building has been completed and is in operation, and the 44th Street extension has been planned and is now under construction.



DETAILS SHOW HOW STRUCTURAL STEEL WAS PLACED TO PERMIT CONTINUOUS RISE FROM EACH LEVEL

Design Factors

The prime consideration in the design was the utilization of the entire Avenue frontage for stores, the depth of these being set at 42 ft 6 in. The next consideration was the type and arrangement of the parking structure. This could be either mechanical or manual. The mechanical, or "bird-cage," type of parking was automatically ruled out by the Building Code, which, had the mechanical type been selected, would have prohibited the stores and limited the parking levels to a total of eight.

With manual parking, the choice then lay between ramp type and elevator. Elevator type garages have been considered unacceptable for many years because of mechanical troubles and the time required to park and deliver the cars. This left only the ramp type for consideration.

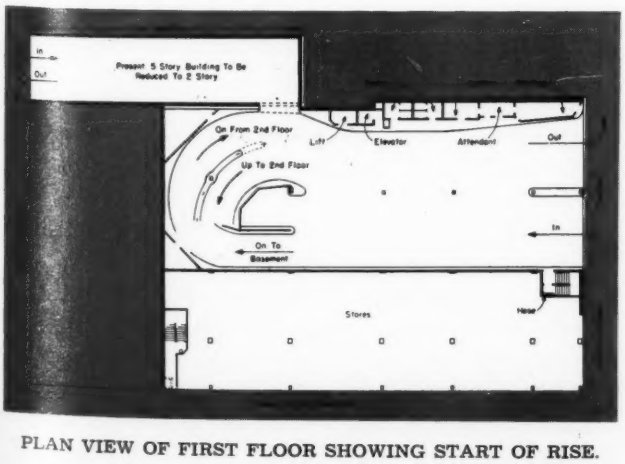
Continuous Sloping Floors Selected

Since there are many variations of the ramp type garage, a study was made of the possibilities. The d'Humy system of staggered floors was ruled out, as this scheme requires double parking. The ordinary ramp type scheme with level floors also was found inefficient for this plot because of space wasted in ramps and traffic aisles.

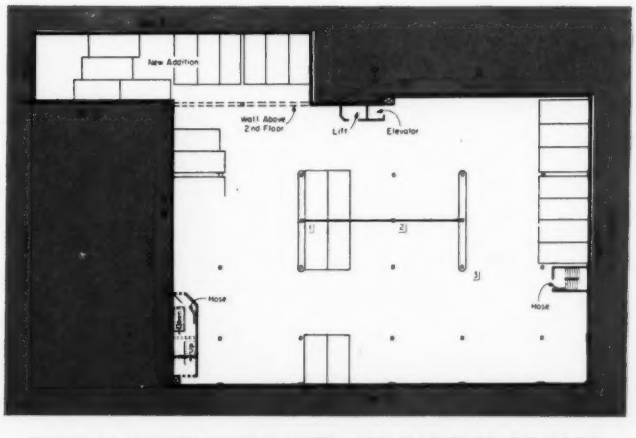
The scheme ultimately adopted was that of the continuous sloping floor, with parking on the sloping floor. For full efficiency with this design, the plot should have been about 20-ft wider than we had at this site. This would have given a parking strip 60-ft wide and spiraling upward at a 5-percent grade from the street to the roof, based on six levels above and one level below grade. However, the necessary additional property could not be acquired, and the design proceeded without it and with slightly lower space efficiency since circular ramps had to be provided to the basement and also to the 2nd floor to clear the store area along the avenue.

Ingress and Egress

The circular ramp to the 2nd floor is of double width to accommodate incoming and outgoing traffic. The ramp to the basement is of single width, as it was felt this area would act only as additional reser-



PLAN VIEW OF FIRST FLOOR SHOWING START OF RISE.



TYPICAL UPPER FLOOR USED FOR PARKING OF CARS.

COMPLETED PARKING GARAGE WITH COMMERCIAL FRONTAGE READY TO LET.

voir space, and safe operation seemed possible with the single-width ramp.

Structural considerations which were foreseen and which ultimately developed dictated the design in steel frame rather than concrete. The five upper levels above the main entrance level made a total length of drive to the last parking space of about 1100 feet, or 1/5 of a mile, and this was considered as the maximum for quick parking and delivery. The average run when the area is full is 550 feet, which takes about one minute at 10 miles per hour.

The use of five upper levels also dictated load bearing walls for the outer structure of the building. While this entailed some difficulties during construction it effected a saving of about $7500 over the the estimated cost of a full skeleton frame.

Parking Pattern

The parking pattern on the upper levels is indicated by the plan. This also shows an elevator for patrons, which would permit operation during labor difficulties, patrons doing their own parking and delivering. It also shows a man-lift for quick vertical transportation of the attendants.

The entrance floor also introduced design problems since some of the main columns had to be offset or eliminated. This necessitated the use of intricate girders at the 2nd level to take the load of the columns above and to provide the desired floor elevations. In addition to the stores, this entrance floor contains the control wing and waiting room, cashier's room, attendant's room, and public toilets.

To attain a gradient of 5 percent, the floor to floor distance was set at 9 ft 1 in., with a minimum clearance of 7 ft, and a depth of construction of 2 ft 1 in. Since a thickness of fireproofing of 2 in. top and bottom is a code requirement, this limited the maximum girder depth to 21 in. However, by resorting to continuous girders in both directions, welded in both shop and field, all of the continuous girders were held to 18-in. depth with some of the simple span girders 21-in. deep. The drawing shows details of these continuous girders and the special girders carrying columns at the 2nd level. Field splices in these continuous girders were located at points of contraflexure although they were welded for full shear and moment values.

Concrete Slabs

In compensating for the low head room under the girders, all filling-in beams were eliminated and a two-way, reinforced concrete, long span system was used, as designed by Republic Fireproofing Company. This is a grid system of 4 x 9-in. concrete beams spaced 20 in. on centers, reinforced top and bottom as required and with slag block fillers to reduce dead weight. Continuous design reduced slab thickness to 9 in. giving a clear height between girders of 8 ft. 3 in.

Since the steel frame had to be erected first, the ends of wall bearing girders were carried on temporary pipe struts of small diameter. These could not carry the floor construction which was the next operation, so wood shores were used to supplement the pipe struts until the outer bearing walls were erected. The bearing plates were shop welded to the girder ends, and all bearings were dry-packed after completion of the walls.

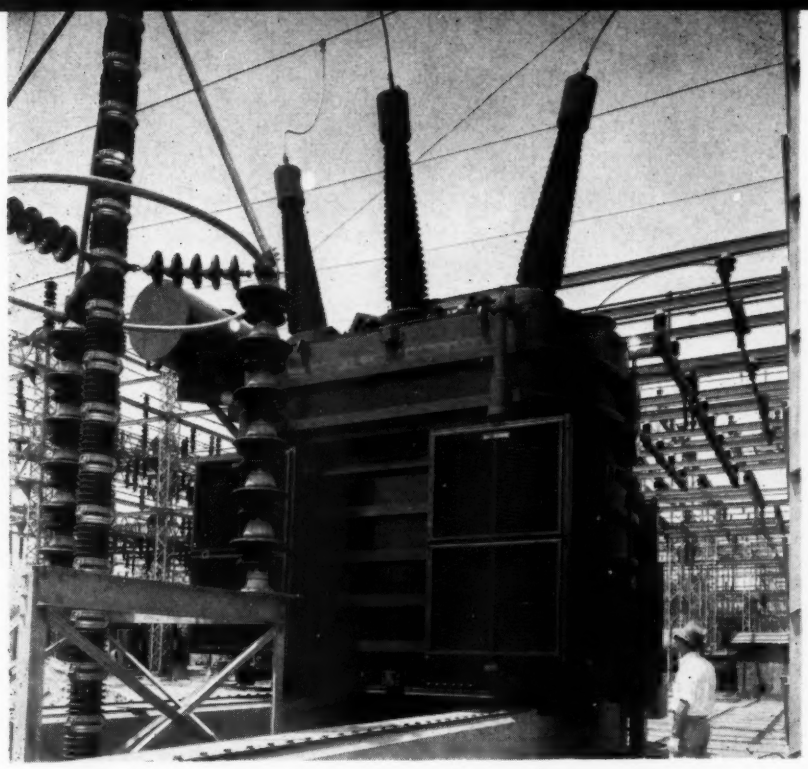
Arrangement of Ramps

The double ramp to the 2nd floor was suspended from the 3rd floor steel construction, and since the ramp to the basement is of single width and does not run parallel to the upper ramp, its load was carried on concrete side walls to the ground.

Except for the stores and the rooms on the control platforms, the parking space is not heated nor are windows provided in the street wall openings. The main roof is waterproofed with built up felt and hot pitch membrane roofing protected with 2 in. of cement top, and the floor level over the stores is waterproofed integrally.

Consultant on welding was Major G. D. Fish. Steel fabrication and erection was by Ingalls Iron Works, and reinforced concrete was by Golino Concrete Co.

The entire design of the structure as well as its erection was handled by our office and involved the negotiating of 30 different contracts for the prime work with 60 subsidiary contracts to arrange spaces for the six stores. ▲▲



COOLERS FOR THIS 150,000 KVA TRANSFORMER OPERATE CONTINUOUSLY. SIMPLE MANUAL CONTROLS ARE USED TO CUT THE MOTORS IN AND OUT.

L. W. SCHOENIG
Transformer Department
Allis-Chalmers Mfg. Co.

How You Should Specify

Transformer Cooling Equipment

MOST LARGE transformers applied to power systems are supplied with some form of forced cooling. Only a few are completely self-cooled units. Increased capacity transformer banks can be realized economically by forced cooling equipment. Usually this cooling equipment or provision for future addition of forced cooling equipment is specified when the transformer order is placed. It is important for the consultant to understand how and why forced cooling is used so that he can specify equipment that will give his client the most economical operation over the longest period of time.

Methods of Control

The control of forced cooling equipment can be accomplished in a number of ways. Usually the cooling equipment is actuated by a top oil temperature or a thermal replica (top oil and load). With this form of control, the cooling equipment is used only as required by temperature or load conditions. The forced cooling equipment for an OA/FA transformer (unit with oil to air heat exchanger plus one stage of forced air), and the first stage of forced cooling equipment for an OA/FA/FA transformer (unit with oil to air heat exchanger plus two stages of forced air), will be energized when the top oil reaches a predetermined temperature. This temperature can be adjusted within limits; however, 65 C is a normally accepted value at which fans are started.

When control is from a thermal relay, the fans of an OA/FA transformer, and the first stage of fans of an OA/FA/FA transformer, will come into play at a hot spot temperature of approximately 70 C. The

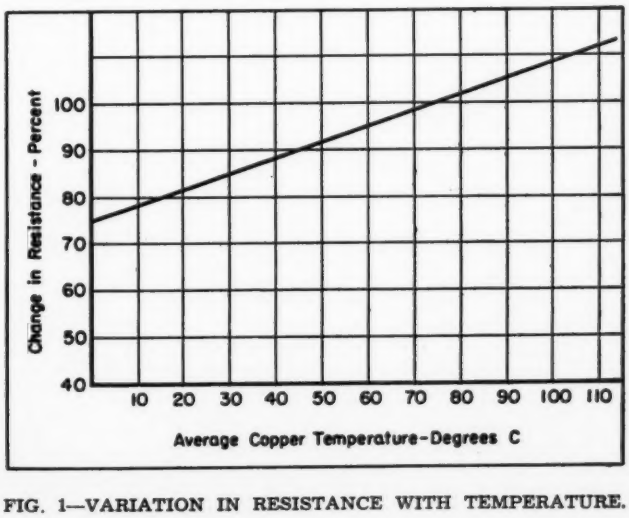
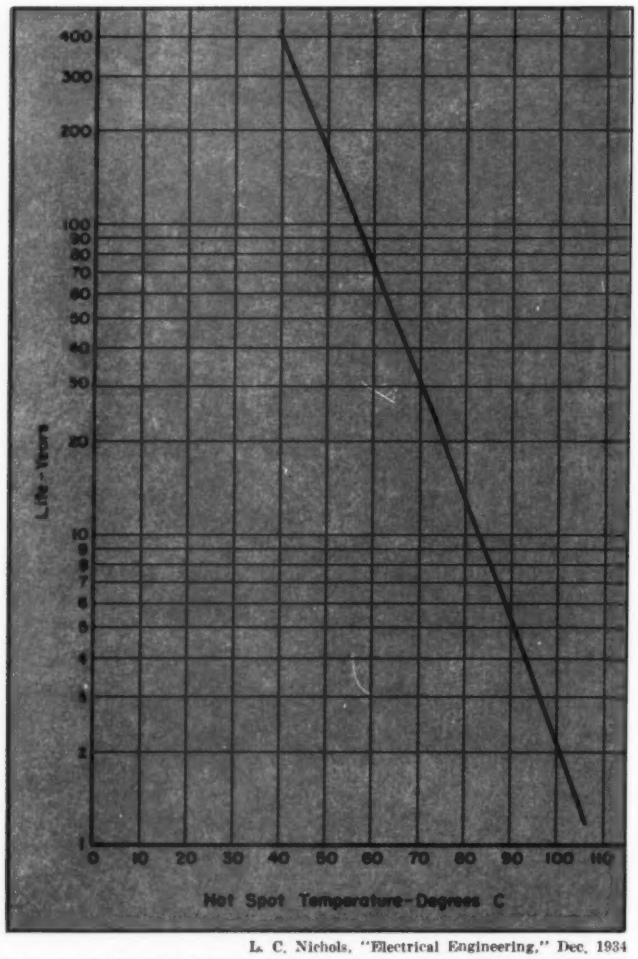


FIG. 1—VARIATION IN RESISTANCE WITH TEMPERATURE.



L. C. Nichols, "Electrical Engineering," Dec. 1934

FIG. 2—TRANSFORMER LIFE VS HOT SPOT TEMPERATURE.

second stage of forced air equipment of an OA/FA/FA transformer, will begin operating when the hot spot temperature reaches approximately 80 C.

Continuous Operation

Although it is more or less the accepted practice to control cooling equipment by temperature, some users operate all cooling equipment continuously regardless of load or temperature. This is particularly true of forced oil cooled transformers, for the forced oil cooled unit has no continuous self-cooled rating, and, therefore, it is necessary that at least part of the cooling equipment operate at all times. However, the continuous operation can be applied to all types of forced cooled transformers.

The primary advantage of operating all of the cooling equipment continuously is the lower operating temperature of average copper, hot spot, and oil. Lower operating temperature results in lower copper (I^2R) loss, since the resistance of the windings is a function of the temperature. The variation of the resistance with temperature is plotted in Fig. 1. Longer transformer life can be expected with all cooling equipment operating, since the rate of deterioration is also a function of operating temperature.

Transformer life is plotted against hot spot temperature in Fig. 2. The short time overload capacity often will be greater with all cooling equipment operating, since the operating temperature prior to the application of the overload is lower. An additional advantage of continuous operation of coolers is a simpler control scheme, for many of the relays and contactors can be eliminated.

Disadvantages of continuous operation of all cooling equipment are the increased cost of auxiliary power and probably increased maintenance expense. However, the power costs for operating the forced cooling equipment frequently may be offset by the decrease in load loss in the transformer. Whether or not there will be greater maintenance with continuous fan operation is subject to question. Some authorities believe that less maintenance will be required because the motors, if continuously operated, will be warmer than the surrounding air, so there will be no condensation on the motor windings and bearings. The saving in load loss is a tangible item which can be evaluated. The increase in transformer life, the additional overload capacity, and greater cost of maintenance of cooling equipment are intangible items to which it is difficult to assign a definite value.

Comparative Results

Results with continuous cooler operation and with thermal relay control of coolers can be compared from data on a 150,000 kva, 230 - 18 kv, three phase, 825 BIL, type FOA transformer. The losses, no load and load, are plotted in Fig. 3. The loss data together with the temperature rises from the certified test report are used to plot the temperature curves in Fig. 4. The lower family of curves plots temperature versus load with all coolers in operation. The upper family of curves plots temperature versus load for half of the coolers in operation.

With half of the coolers operating, the transformer will carry 70-percent load without exceeding a 65 C hot spot rise. With thermal relay control, the second set of fans will begin operating at approximately 55-percent load, or a hot spot temperature of about 70 C. With all coolers in operation, the temperature at which the transformer operates is from 10 C to 18 C lower than if half of the coolers are used (0 to 55-percent load).

At 50-percent load, operation of all coolers results in a 17 C lower operating temperature. This temperature difference, as shown in Fig. 1, results in a 5½-percent reduction in resistance. Since the copper (I^2R) loss at 50-percent load is 152.5 kw, a 5½-percent reduction in resistance provides a saving in copper loss of about 8.5 kw. This is approximately the power requirement for the second set of coolers.

A comparison of continuous fan operation and thermal relay control of fans also is made for a 37,500/50,000/62,500 kva, 138/69-12 kv, three phase transformer. The hot spot temperature versus load

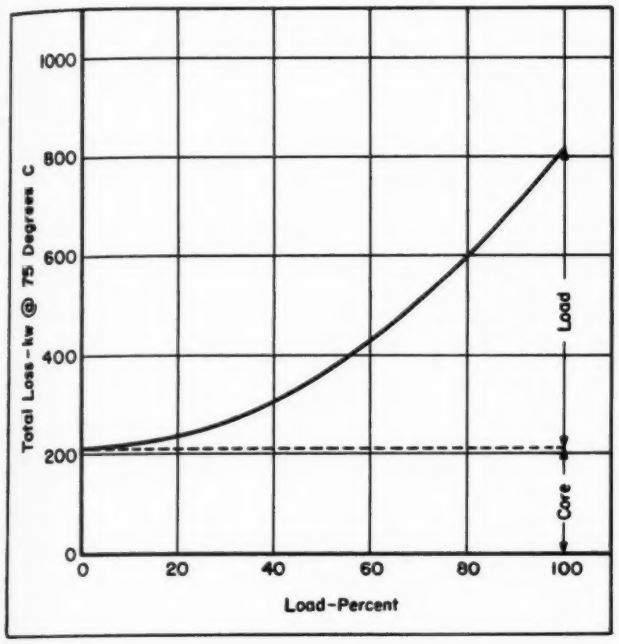


FIG. 3—LOSSES, NO LOAD AND LOAD, FOR A 150,000 KVA 230-18 KV, 3 PHASE, 825 BIL, TYPE FOA TRANSFORMER.

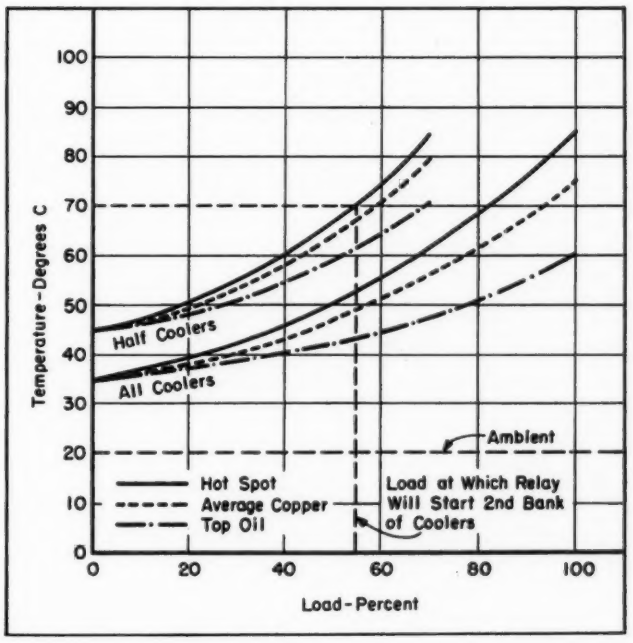


FIG. 4—TEMPERATURE VS LOAD WITH ALL COOLERS (BOTTOM CURVES) AND HALF OF THE COOLERS IN OPERATION.

is plotted in Fig. 5 for OA, OA/FA, and OA/FA/FA operation. The vertical dotted lines indicate the load at which the thermal relay control actuates the first and second sets of cooling fans. It can be seen that if all the fans operate continuously, the hot spot temperature will be from 8 C to 16 C lower, depending on the load. Some authorities have indicated that the operating life of the transformer doubles with each incremental 8 C decrease in hot spot temperature. While this may not be entirely accurate, it is obvious that the life will be increased materially if the operating temperature is reduced.

Average copper temperatures are plotted in Fig. 6. At 100-percent load (the normal self-cooled rating), the average copper temperature is 18 C lower if all fans operate rather than if the unit is operated as a self-cooled transformer. As shown in Fig. 1, this temperature differential results in a 5.8-percent decrease in resistance. Since the I^2R loss is 69 kw at 100-percent load, this decrease in resistance results in a 4-kw reduction in copper loss. With a power requirement for all of the forced air fans of 3.25 kw, this means a saving in power of 0.75 kw or 18 kwh per day is realized. A similar comparison also can be made for OA/FA operation.

For many installations, it also can be shown that if all the fans are operated the saving in load loss resulting from lower operating temperature will more than compensate for the power requirements of the fans. In addition, greater short time overload capacity and longer transformer life can be realized.

Consulting engineers called upon to select transformers for clients should consider these factors before writing specifications. ▲▲

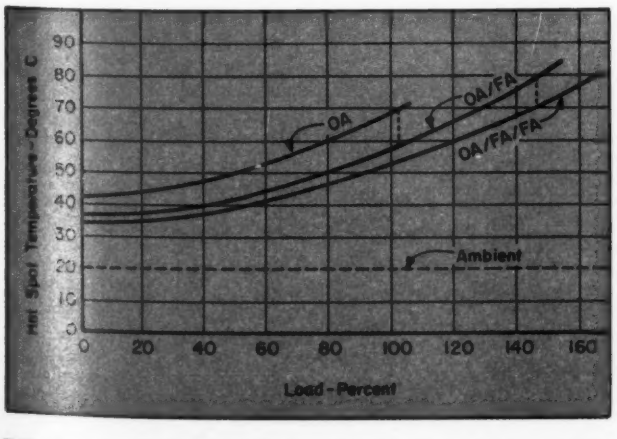


FIG. 5—HOT SPOT TEMPERATURE VS LOAD FOR A 37,500/50,000/62,500 KVA, 138/69-12 KV, 3 PHASE TRANSFORMER.

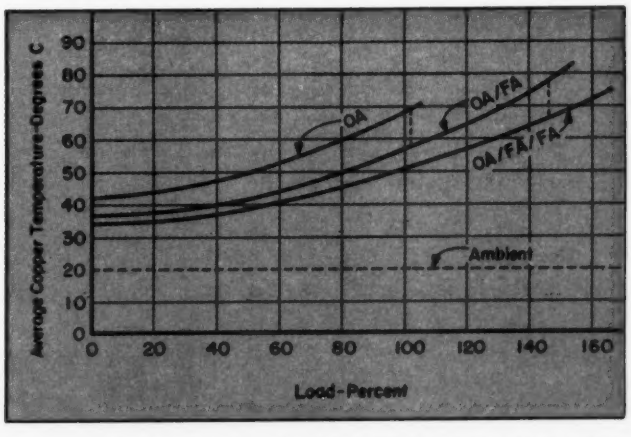
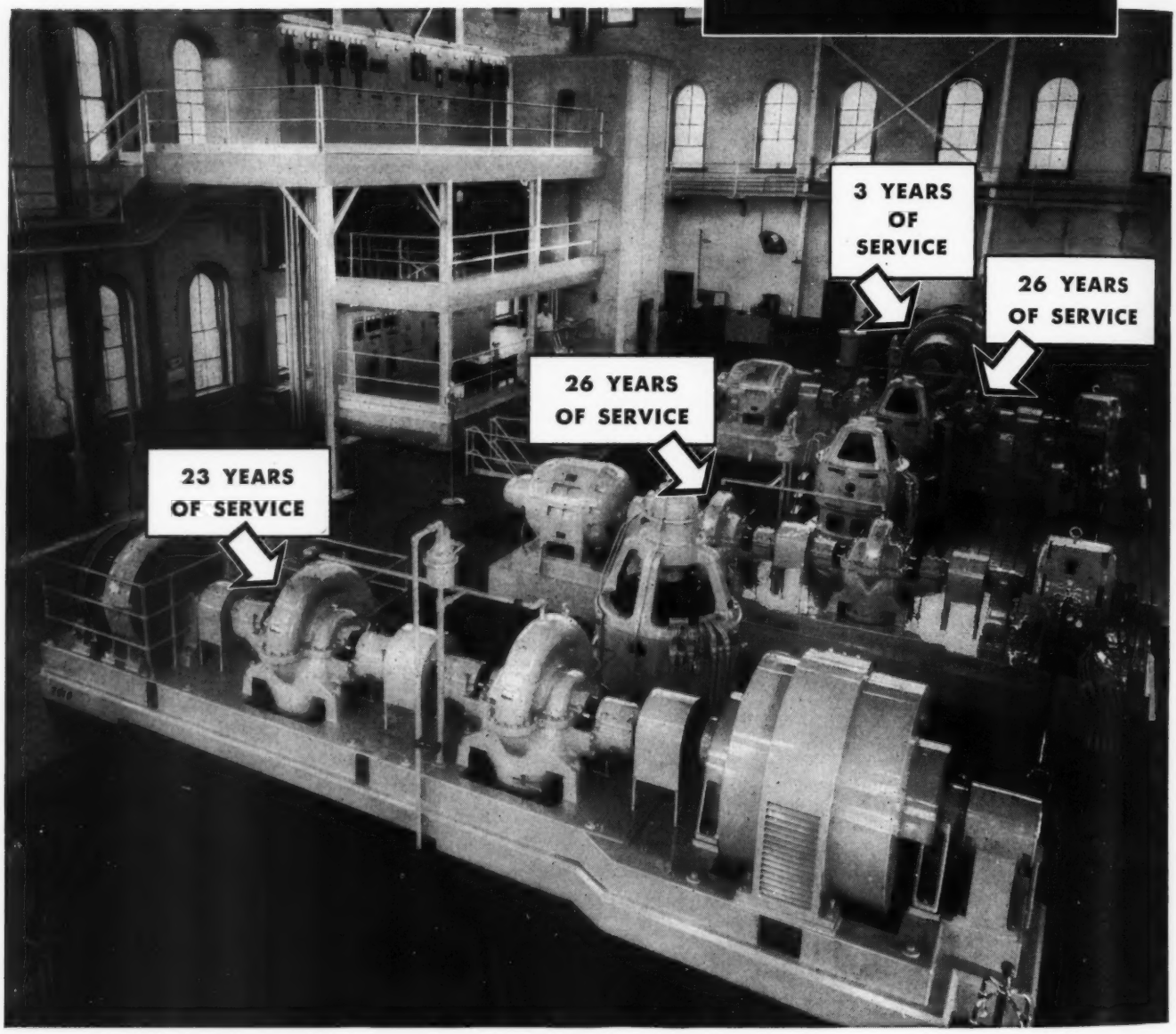


FIG. 6—AVERAGE COPPER TEMPERATURE VS LOAD, SAME TRANSFORMER, WITH OA, OA/FA, & OA/FA/FA OPERATION.

Nashville goes to 100 mgd with

DE LAVAL
CENTRIFUGAL PUMPS



The years of service shown on these De Laval centrifugal pumps tell their own story of dependability and progress. By revising its facilities, the George Reyer pumping station in Nashville has boosted its pumping capacity to 100 million gallons per day.

The De Laval pumps play an integral part in this more efficient operation. For example, the newest De Laval unit handles 40 million gallons per day.

In fact, 80% of all cities in the United States, with a population of 100,000 or over, use De Laval centrifugal pumps. Capacities of De Laval centrifugal water works pumps range from 100 thousand to 100 million gallons per day. Write for your copy of new De Laval Bulletin 1004.

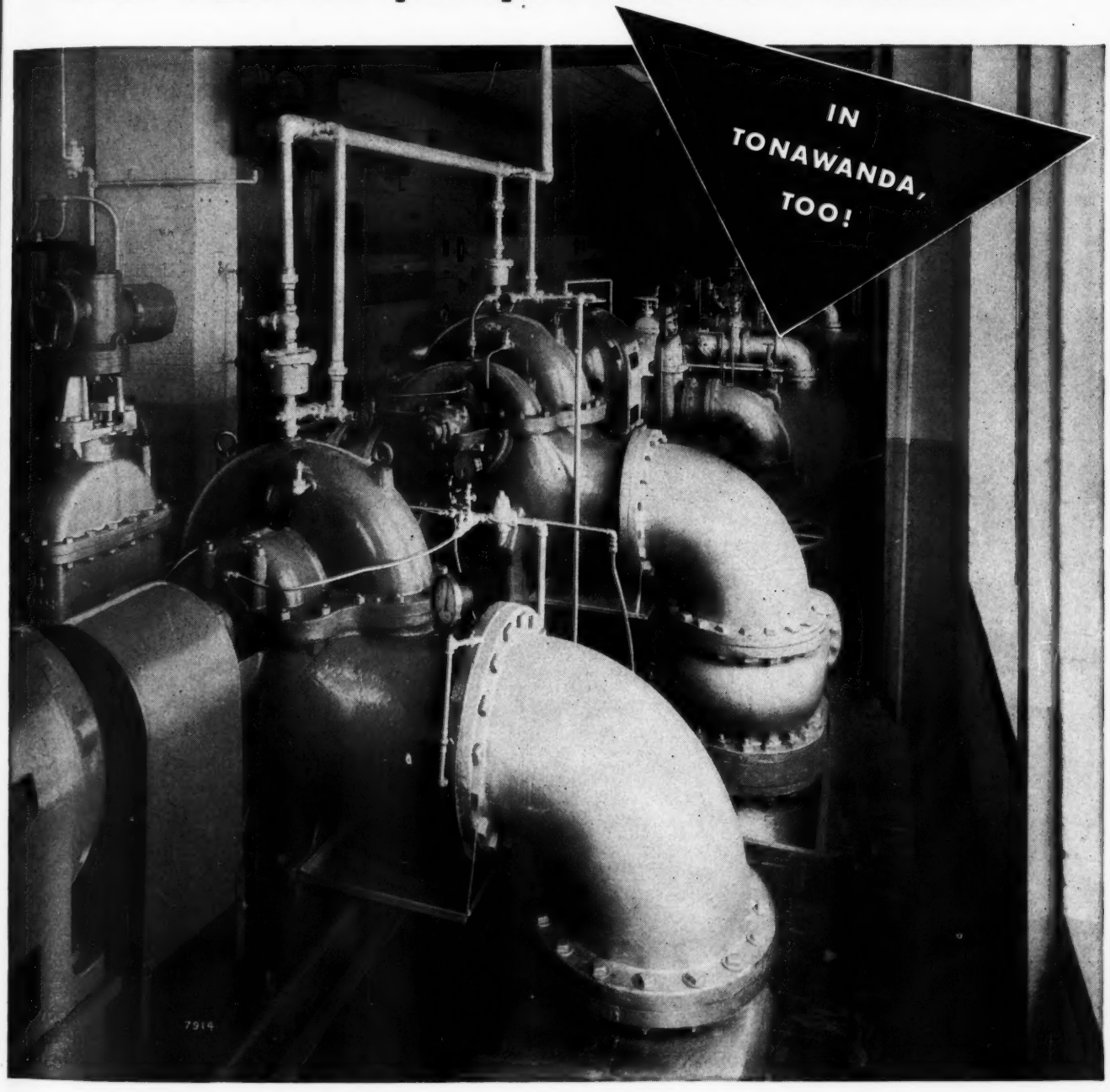
DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY

894 Nottingham Way, Trenton 2, New Jersey

DL 306

DE LAVAL pumps America's water...



Six De Laval pumps are on the job in the recently modernized Tonawanda, New York water works. These efficient pumps have a total capacity of 40 mgd, thus help meet the increased needs of this growing community.

Today 80% of all cities in the United States, with a population of 100,000 or over, use De Laval centrifugal pumps. Capacities of De Laval centrifugal water works pumps range from 100 thousand to 100 million gallons per day. *Write for your copy of new De Laval Bulletin 1004 giving data on these pumps.*

Consulting Engineers:
Metcalf & Eddy,
Boston, Massachusetts

Operating Superintendent:
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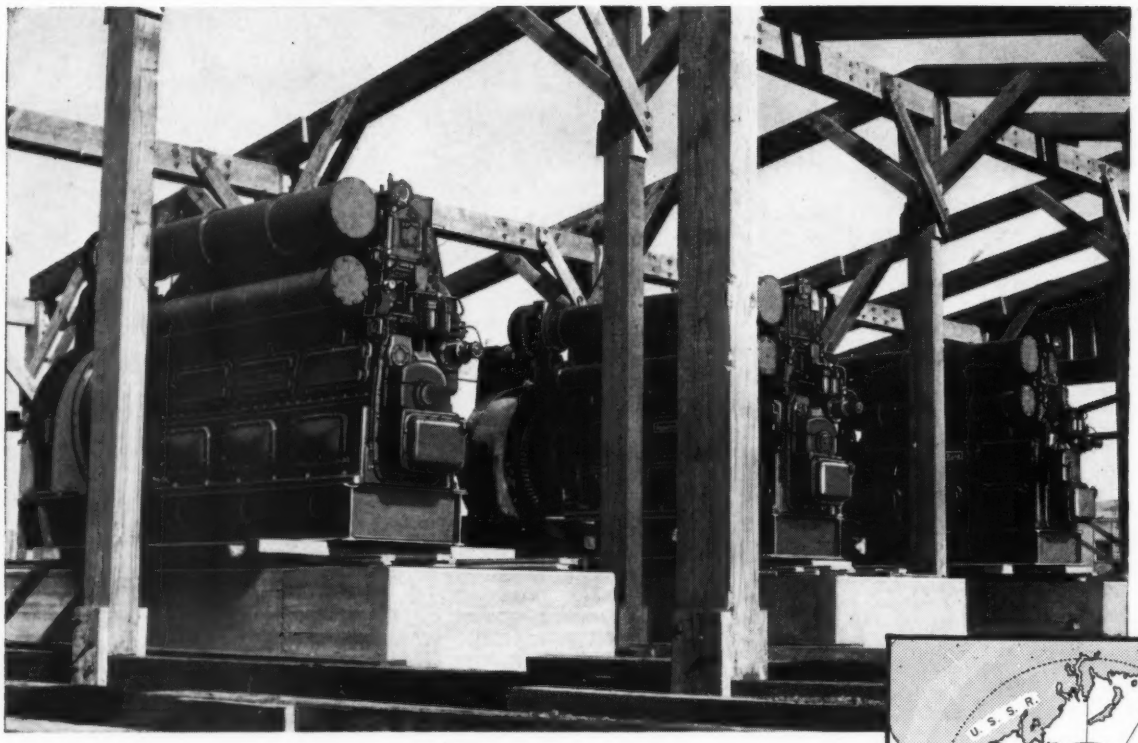
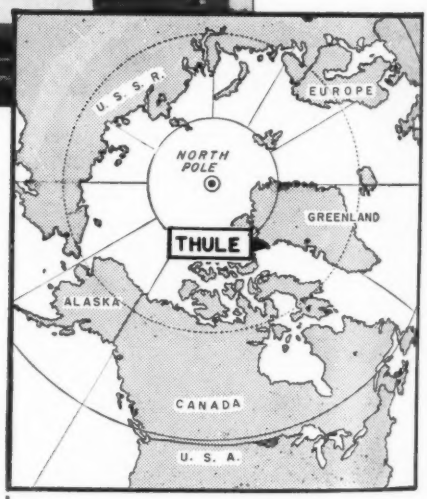
DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
894 Nottingham Way, Trenton 2, New Jersey

DL322

Sitting on top of the world





Over 30 Ingersoll-Rand Diesel Engines generate electric power for north polar air base . . .

Here at Thule — civilization's northernmost outpost, only 900 miles from the pole — the fierce arctic winter is 8 months long, with temperatures of 50 below zero and hurricane winds up to 150 miles an hour! At an isolated outpost like this, the traditional *dependability* of Ingersoll-Rand diesel engines is a tremendous asset.

The engines generate electric power for the new 480 acre American air base at Thule. Three of them are shown above during construction of one of the power plants.

The engines were shipped completely assembled. Their *compact design* and low weight-to-horsepower ratio simplified handling and installation under very difficult conditions. Low fuel consumption, too, is an important consideration for a diesel engine installation such as at Thule. It's also one of the reasons why I-R diesels are repeatedly selected when *economy of operation* and *heavy-duty service* must be combined.

Ask your nearest Ingersoll-Rand engineer to tell you about the many other important advantages of I-R heavy-duty 4-cycle diesels — built in sizes from 200 to 900 hp.

946-7

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

Construction of the diesel power plants at Thule was an ingenious solution to one tough problem called "perma-frost", a condition in which the earth a few feet below the surface is frozen to rock-like hardness. Ordinary building foundations were ruled out. The diesel-generator units were bolted to thick concrete slabs resting on piles set into the frozen ground. Buildings were constructed around them with floors laid on timbers above the ground. The underfloor air space insulates the building from the earth — and heavy concrete weights anchor the structures against the strong winds.

COMPRESSORS • ROCK DRILLS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

The International Electrotechnical Commission is now working for adoption of . . .

International Standards

JOHN F. LEE
Professor of Mechanical Engineering
North Carolina State College

THE IMPORTANCE of standards and standardization of procedures is acknowledged by most engineers. Of particular importance to the consulting engineer is the establishment of equipment standards, since he must design and specify within the framework of these standards. Most consulting engineers have welcomed standardization as a boon in estimating the cost and performance of both equipment and materials. Untold design, drafting, and construction time has been saved as a result of standardized procedures and availability of standard specifications.

Despite the obvious advantages of standardization, it is clear that standards are only as good as the universality of their application. For example, standards established for American products are of little use to the consulting engineer engaged in foreign work if a different set of standards are applicable in the country in which the project is undertaken. If no standards exist in a country where a foreign project is undertaken, the situation is even worse.

All consulting engineers will be interested in learning of the activities of an organization now working toward international technical standardization. The consulting engineers engaged in foreign projects will be especially affected by the work of this group. And since international agreements are bound to affect our own technical standards, the consulting engineer whose work is entirely domestic also should be vitally interested.

Standardization in the United States

Technical standardization long has been accepted as a desirable fact of industrial life in the United States. In earlier times standards were set primarily by trade associations, which often subscribed to conflicting standards. In 1918, the American Standards Association, then known as the American Engineering Standards Committee, began to broaden the scope of standardization with a view to increasing the universality of application and to eliminating conflicting standards. The success of this program is well known to all engineers. In fact the effect of standards established by the American Standards Association and the engineering societies has been so beneficial to the industrial growth of the nation that many foreign countries look to them as a model for future action.

International Standardization

The electrical industries in Europe and the United States pioneered in the fostering of international standardization. The first international meeting was held in Paris, in 1881, under the auspices of the International Congress of Electricians. Subsequent meetings of this organization were held in 1893, 1896, and 1899. Another organization, the International Electrical Congress, held a meeting in the United States, at St. Louis, in 1904. Up to this point standardization was limited to nomenclature of principal electrical components and the ratings of electrical machinery. At the St. Louis meeting, a resolution was adopted founding the International Electrotechnical Commission, and this group was charged with the responsibility of coordinating and unifying international standards not under the cognizance of existing international organizations.

The first meeting of the International Electrotechnical Commission drew delegates from 13 nations and was held in London, in 1906. Lord Kelvin

was elected the first president and remained the guiding influence of the Commission. Today, the International Electrotechnical Commission is an autonomous affiliate of the International Organization for Standardization. Thirty nations, including the United States and nations of every continent, now subscribe to the standards set by the International Electrotechnical Commission and appoint delegates to represent them on the Commission. Each country has a national committee that serves as its official representation on the Commission.

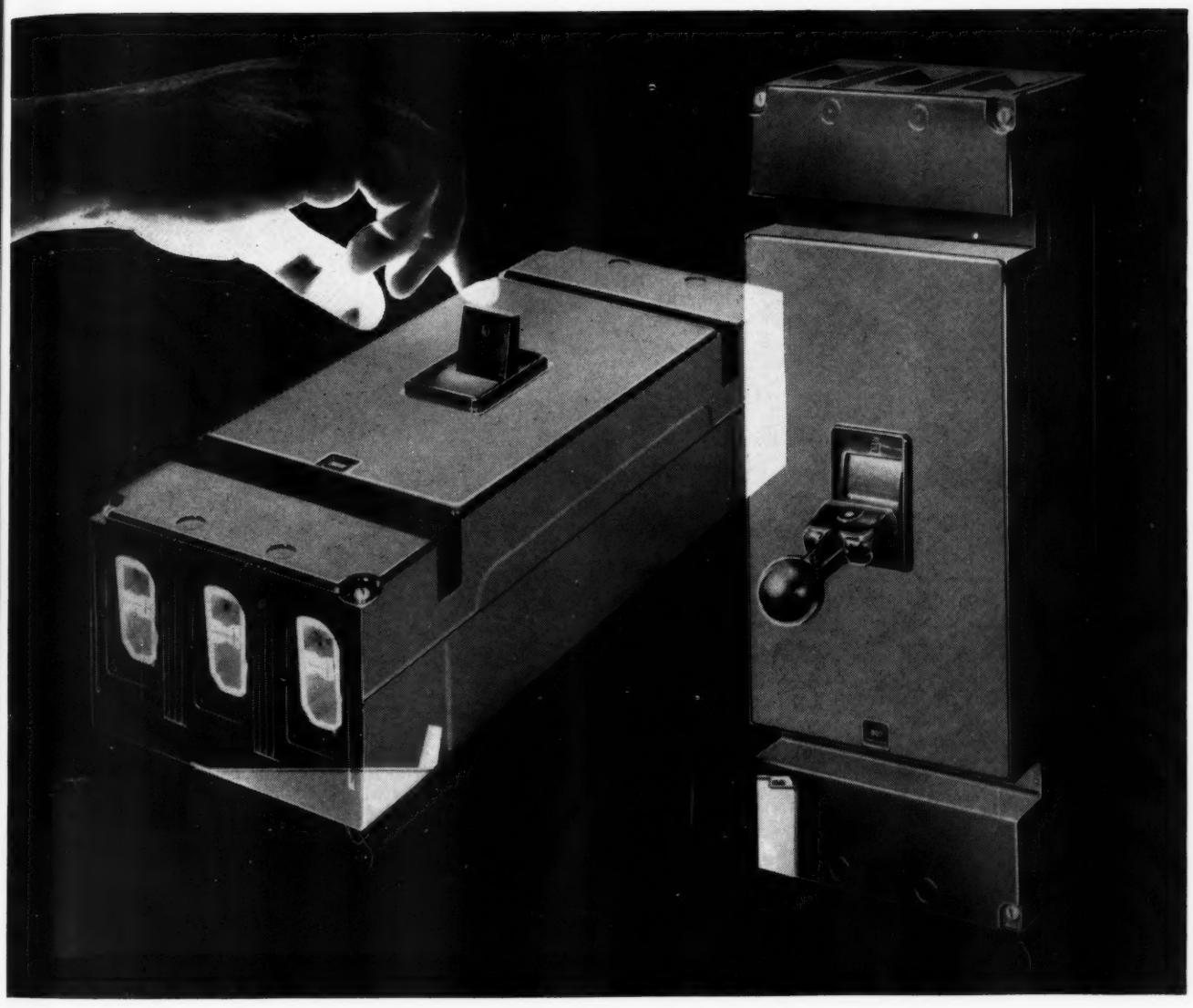
In the United States, the national committee is associated with the American Standards Association and draws its membership at large, plus representatives from the ASA and the ASME. The U. S. National Committee has several technical subcommittees dealing with various aspects of standardization. Three of these technical committees, responsible for internal combustion engines, hydraulic turbines, and steam turbines, are supported administratively by the American Society of Mechanical Engineers.

International meetings are held annually in various parts of the world. In 1954 an annual meeting was held in Philadelphia, with about 400 delegates from 25 nations in attendance. This year the annual meeting will be held in Munich, Germany from June 30 to July 4, and standard purchase specifications for steam turbines and rules for acceptance tests will be acted upon. Details of the recommended international standards will be released for publication after this meeting. When these standards become official, they will eliminate many of the difficulties encountered by consulting engineers working on power projects in any of the 30 nations represented on the Commission. Some of the compromises and new standards incorporated are bound to influence our own national standards.

The U.S. Committee on Turbines

The leadership in developing new international standards for steam turbines came from the U. S. National Committee. Technical Committee 5 was charged with direct responsibility for the new standards. This committee included leaders from manufacturing industries, consulting firms, and power companies under the chairmanship of Dr. A. G. Christie. Mr. B. C. Thorn, of International General Electric Company, is secretary; and other members include Messrs. M. D. Church; C. W. E. Clarke; H. C. Dennis; Harry Engvall; F. P. Fairchild; C. C. Franck; J. H. Harlow; P. H. Knowlton; J. F. Lee; J. W. McDonald; A. L. Penniman; H. V. Rasmussen; F. A. Ritchings; C. A. Robertson; W. F. Ryan; O. D. Whiddon; and G. V. Williamson.

Consulting engineers who wish to get detailed information on international standards should write Mr. S. David Hoffman, Assistant Secretary of the U. S. National Committee, IEC, American Standards Association, 70 E. 40th St., N. Y. 17, N. Y. ▲▲



The Westinghouse Type M—only fully rated 800-ampere, molded-case circuit breaker . . .

Saves 3/4 cost of larger devices

Over a year of customer use, as an alternative to larger 800-ampere protective devices, has proved the economical advantage of the Westinghouse Type M AB De-ion® circuit breaker.

Whether you use it singly enclosed or in a switchboard, you'll find it can save ¾ the cost of a larger air circuit breaker. Space or mounting economies may run the savings even higher—such as the use of this design in building compact distribution panelboards.

Though the smallest device of its rating, the new model will carry its full current rating in normal ambients even when enclosed—something other thermal devices cannot do. This feature of ambient compensation is useful in applications where standard units might unduly penalize system capacities. Both the Westinghouse *true 800-ampere* alternate and the standard thermal magnetic trip types are U.L. listed.

You owe it to yourself to get all the facts on the Westinghouse Type M circuit breaker. Get 'em today from your local Westinghouse sales office—or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

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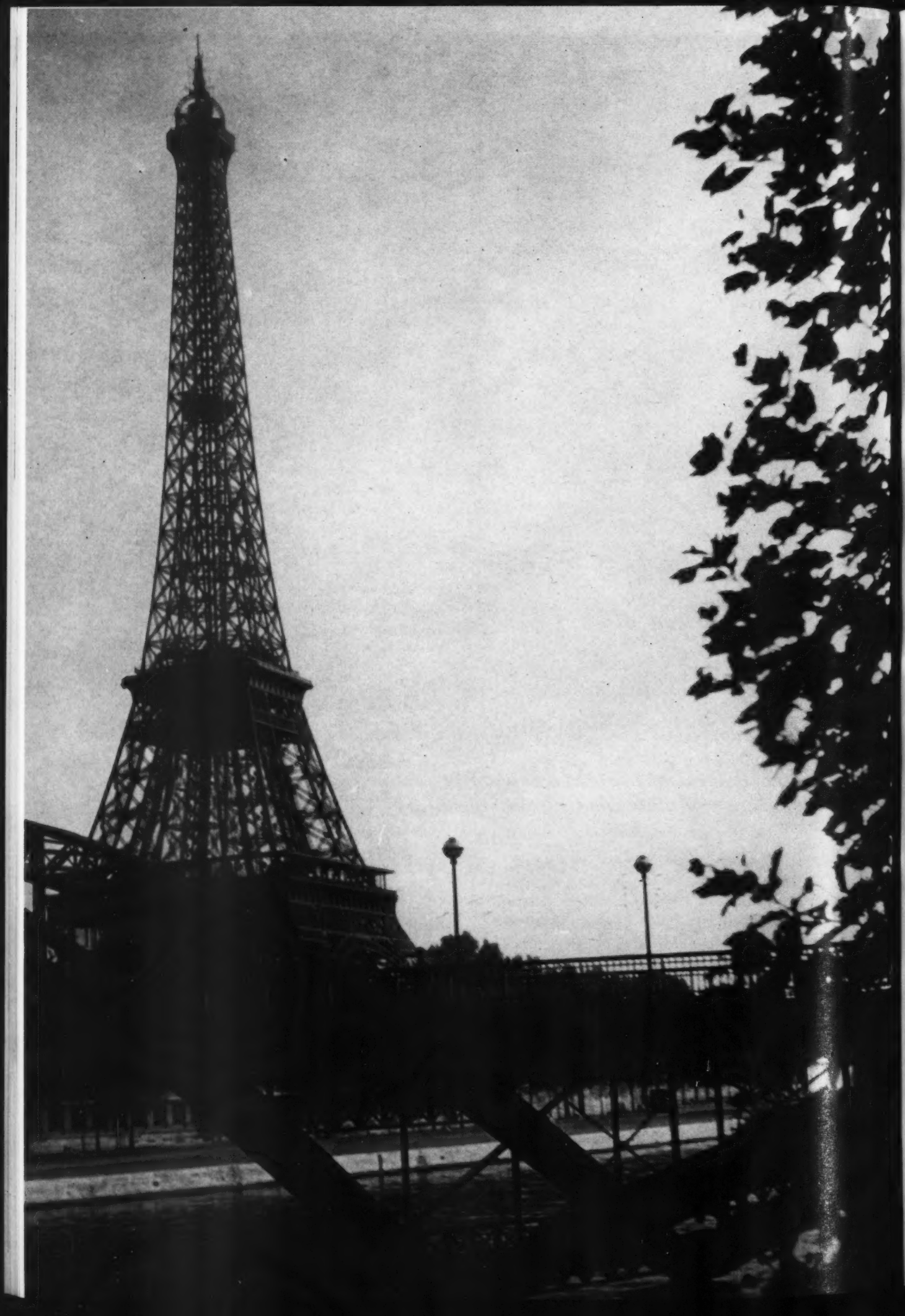


Report from Europe

A group of consulting engineers from the United States spent a month in Europe on a tour arranged by the Editors of CONSULTING ENGINEER. In England, Holland, Germany, Switzerland, and France, they visited the offices and projects of consultants and discussed with them the problems of private practice.

STAFF REPORT

Photos by CONSULTING ENGINEER

IN ARRANGING a European Tour for a group of consulting engineers from this country, CONSULTING ENGINEER magazine had several objectives in mind. Most important, with the consulting engineers in this country about ready to form a National Federation, it seemed a good idea for some American consultants to meet with some of the European Associations and find out what they have been able to accomplish for their members and what qualifications are required for membership in the International Association of Consulting Engineers.

Another important reason for having U.S. consultants get together with their European contemporaries was the exchange of information on business methods used in the various countries. How, for example, do the European engineers deal with architects, contractors, manufacturers, and other engineers? How do they set their fees? How do they deal with the nonassociation member who cuts his fees—or the manufacturer who offers "free" engineering to the client who buys his equipment?

Yet another reason for the visit was to observe new ideas in design and study new materials being used in construction projects. There was, also, a sincere desire to meet these European engineers and know them personally, hoping that this might lead to better understanding and mutual professional respect.

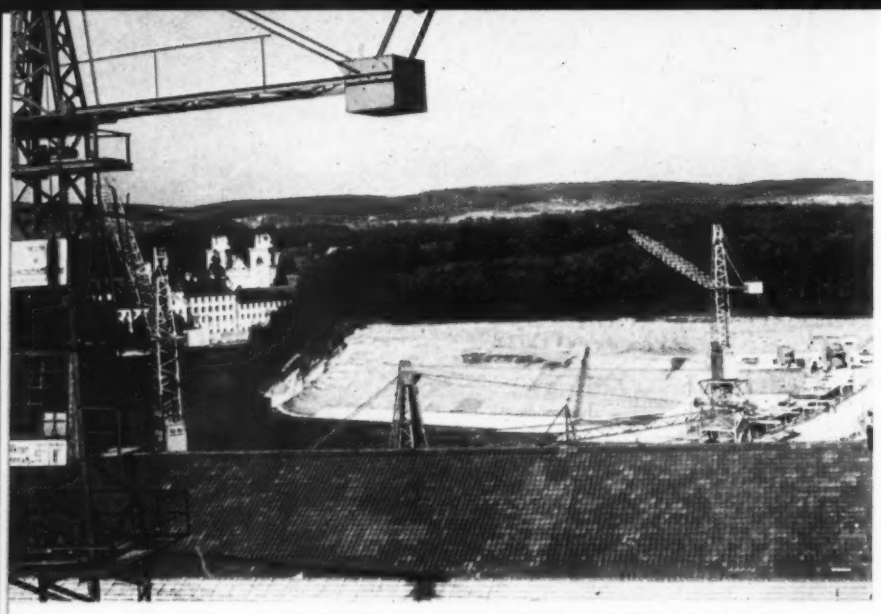
It would be asking too much to expect that all of these ends could be accomplished in a 30-day trip covering five countries, but a remarkable amount of understanding was brought about despite the short time—and the language barrier in some countries.

England

The English consultants were hospitable, indeed. The officers of the Institution of Civil Engineers, who really had no reason for feeling that they needed to do anything for American consultants, had waiting for us on arrival an invitation to visit their offices in Great George Street. There we were greeted by Mr. W. K. Wallace, President, Alexander McDonald, Secretary, and other members of the Institution of Civil Engineers.

In being shown through the building, we noticed in the library a number of men taking written examinations. To become a member of the Institution of Civil Engineers (or of the Institution of Mechanical or Electrical Engineers) it is necessary for the applicant to take an examination proving his proficiency in his field. This means that membership in one of these Institutions is about the equivalent of membership in one of our Founder Societies, plus registration through examination. There are no state registration requirements for engineers in England.

IR. H. RUSTING, SECRETARY OF INTERNATIONAL FEDERATION, AND WILLIAM MOORE, PRESIDENT OF CALIFORNIA ASSOCIATION, DISCUSS PROPOSED CONSTITUTION FOR U. S. FEDERATION OF CONSULTANTS.



PROBLEMS ARE MORE POLITICAL THAN TECHNICAL IN CONSTRUCTION OF THIS DAM ACROSS THE RHINE, HERE SEPARATING GERMANY FROM SWITZERLAND. RECREATION AREA IS INVOLVED.

CONSTRUCTION METHODS AND MATERIALS ARE ON PERMANENT DISPLAY IN DUTCH EXHIBITION BUILDING.

AMERICAN CONSULTING ENGINEERS WERE TAKEN BY THE DUTCH ON AN INSPECTION TRIP OF ZUIDERZEE TO SEE HOW DYKES ARE BUILT AND LANDS RECLAIMED FROM THE SEA. HERE IS DETAIL OF PARTIALLY COMPLETED DYKE.

From time to time, registration has been discussed, but so far Parliament has taken no action, and there is considerable opposition, just as there was in this country 10 to 20 years ago.

Following the tour of the Institution headquarters, the group moved to St. Ermin's Hotel for a luncheon, as guests of the Association of Consulting Engineers. If these British engineers are as good at planning projects as they are at arranging luncheons, they must be the world's best. As each member of the group entered the dining room, he was given a set of papers outlining the background and engineering specialty of each of the American guests and each of the British Association members—and a table plan showing the seating arrangement. By skillful handling of introductions during the social hour before the luncheon, every person present felt completely at ease by the time the first course was served. The British hosts also were thoughtful enough to invite Mr. F. E. Rogers, of the American Embassy, and Mr. P. W. Ridley, of the Office of European Economic Cooperation Mission, who was arranging for a group of European engineers to visit the United States.

Since the seating arrangement had been carefully planned, each of the American consultants found himself beside a British engineer who specialized in his field. During the dinner each British engineer invited one of the American engineers beside him to visit one of his projects and his office to discuss

business methods, ethical practices, or modern construction techniques. For example, Hugh Duffill, of Boston, an expert on coast protection, was invited by Mr. Jack Duvivier, of Lewis and Duvivier, to his office, where they discussed projects on which they are now engaged, Duffill explaining some of the methods he uses, while Duvivier, and his partners, F. L. Harwood, and J. A. Lewis, explained details of their recent projects. As a result of this visit, Duffill became so interested in the coastal protection of Brighton, that he made a side trip of over a hundred miles to visit that coast protection project.

Similarly, each of the American engineers visited the offices of the English consultants, noted their methods of operation, and exchanged ideas.

The following day the American engineers were guests of the Institution of Mechanical Engineers, first for a tour through their building, which is just across the street from the Institution of Civil Engineers. On this tour one of the party noticed a bust of Napier, and commented that London seemed practically overflowing with statues of the man. It was explained that there were several Napiers of prominence. This one, John, was a Scottish mathematician, another, Charles, was a British general, while a third, Robert, was a Field Marshall. Colonel C.W.G. Walker, Secretary of the Association of Consulting Engineers, then told a story about the Field Marshall, who, after a difficult battle with the natives, finally captured the Indian province of Sind. He thereupon sent a cable to the British War Office containing but one word, *peccavi.*

A long silence followed, broken by chuckles from the British and weak smiles from the Americans. "Oh ho," Walker said, "I see you do not know your Latin. *Peccavi* means, 'I have sinned.' "

The luncheon with the Mechanicals was held at St. Stephens Club, a Tory club of long standing, to which Disraeli belonged. There is a tunnel running from the club to the Parliament building, and anytime there is a vote called, a bell rings in St. Stephens to collect any of the MP's who might be present. This was a most excellent luncheon attended by both the President, Mr. T. A. Crowe, and the Secretary, Mr. Brian G. Robbins, as well as several members of the Institution.

At the Institution headquarters, prior to the luncheon, the American consultants spent almost an hour in a discussion with Mr. Julian Tritton,

CONSTRUCTION CRANES ARE ACCEPTED PART OF THE LONDON SKYLINE, AS CITY TAKES ON A NEW FACE.

ROBERT NAEF, OF THE SWISS ASSOCIATION, EXPLAINS THE DESIGN FOR A LARGE CONCRETE BRIDGE TO PART OF U. S. GROUP DURING A VISIT TO THE SITE. BRIDGE WILL BE POST-STRESSED INSTEAD OF PRE-STRESSED CONCRETE.


When All things are c
...the better lighting c
Louvers on Varsity units may be opened from either side to facilitate servicing.
Benjamin translucent louvers are easy to keep clean by simply dipping in detergent-and-water solution.
All these things considered...
1. Specific Units for Every Need
2. Precision Construction
3. Low Installation Cost
4. Minimum Maintenance Cost
5. Lowest Over-All Cost
make BENJAMIN the choice for better lighting!

For lowest cost steam, KVP Company burns coal the modern way

The engineering department of the Kalamazoo Vegetable Parchment Company, following an extensive fuel survey, decided to meet increased power demands by burning coal the modern way.

Five of eight existing coal fired boilers of varying age were replaced by one new boiler capable of burning a diversified range of coals. In addition, automatic coal handling equipment was installed. With it, coal is automatically dumped, magnetically cleaned, carried to the power house by a moving belt, crushed, pulverized and fed into the furnace.

These new facilities have resulted in increased steam capacity, lower operating costs and lower fuel costs.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building • Washington 5, D. C.

Note to consulting engineers

Many companies planning a new power plant, or the remodeling of a present one, consult an engineering firm on its design and construction. When you have such a project, our Engineering Department will be glad to assist you in your fuel cost survey with any coal information you may require. In most cases, for the reasons listed below, the use of coal results in substantial savings in increased efficiency and fuel economy through the years.

facts you should know about coal

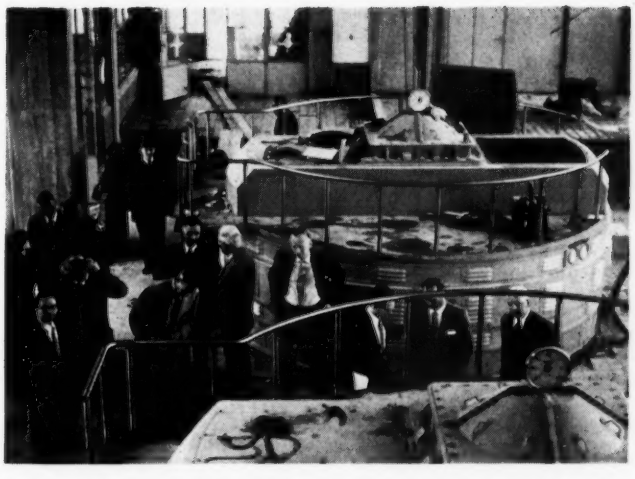
In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

President of the Association of Consulting Engineers and President of the International Federation (FIDIC). At this meeting, Mr. Tritton explained the requirements an association of consulting engineers would have to meet in order to become a member of FIDIC. Basically, it is necessary that all members of the association applying for membership be independent engineers in the strictest sense of the word. That is, if there were to be a National Federation of Consulting Engineers organized in the United States, every member would have to be an independent engineer in private practice in order for the National Federation to apply for membership in the International organization.

Independent means that the member engineers would have to be completely free from any connection with manufacturers, contractors, or any other business organization where a connection could prejudice or influence the recommendations an engineer would pass on to his client. Also, it means that the engineer's payment for his services should come only in the form of fees from his clients. Other requirements might vary somewhat according to the customs of the country, but Mr. Tritton emphasized that this independence of the profession is vital to consulting practice.

The American engineers explained to Mr. Tritton that this concept was well understood in the United States, and that while we, as well as England and other European countries, have many many large and excellent firms who do both engineering and construction, membership in the existing state and regional associations of consulting engineers is limited to independent engineers who have no connection, directly or indirectly, with any commercial or construction organizations. It was pointed out that the first draft of the Constitution of the Proposed National Federation of Associations of Consulting Engineers, in the U.S., contains the statement that "No member shall have any commercial sales or contracting interests or other affiliations which cause a conflict of interest with his independent practice of consulting engineering."

It was interesting to note that while the American group heard, in England and throughout Europe, considerable criticism of the United States as a country where all the engineering work is done by large, constructor-engineering firms or by manufacturers, every member of this American party was an independent consulting engineer, while about half of the party of European "consulting" engineers now visiting the United States are employees of contractors, manufacturers, or government agencies. In fact, there was fear in some quarters that this mixture of independent consultants and other engineers might lead to further confusion in the minds of American engineers as to the status of the independent consultant in Europe. However, this fear was not justified, for full explanations as to



U. S. CONSULTANTS AND THEIR DUTCH HOSTS VISIT A NEW PUMPING STATION ALONG THE ZUIDERZEE. THIS STATION WILL HELP PUMP A NEW POLDER DRY.

the types of engineers on the trip have been made at each of their meetings, with our various state associations of consultants.

At this meeting with Mr. Tritton in the Institution Building, the American group also was questioned closely as to the methods used for securing business. The British, it seems, have an item in their bylaws which states that "No member shall solicit professional work either directly or indirectly . . ." There was considerable discussion as to just what "solicit" means, and the American consultants pointed out that there are "many and devious" methods of getting jobs that might or might not be considered solicitation of work. While the British, officially, never go to a prospective client's office in search of work (nor do American consultants as a rule) it was admitted by some British consultants that a lot of indirect solicitation goes on in clubs, after lunch with a prospective client. In other words, call it what you will, things are about the same the world over. Also, so far as could be determined, none of the other Associations in FIDIC have in their rules any stringent prohibitions concerning the solicitation of business.

All of the members of the American group were impressed by the manner in which the British consulting offices were operated. The principals and partners seemed strangely untouched by the work going on about them. The drafting rooms and general offices looked much as do most of our offices, but the private offices of the principals seemed more like the inner sanctums of large financial institutions—heavy walnut furniture, velvet drapes, thick carpets, and the smell of expensive cigars. A consultant from California returned to the hotel after an afternoon in one of these executive offices and commented, "Wait 'till I get back to California. I'm going to call in an interior decorator; inaugurate a tea-break; and the first time a client calls and says he has to have his work in a hurry, I'm going to tell him

MODERN OIL AND GAS FIRED BOILERS

The boilers illustrated here cover the broad capacity range from 4,000 to 600,000 lb of steam per hr. They are all especially designed for gas and/or oil firing. The two units illustrated at right (Types VP and VU-55) are standardized and each is available in several sizes. The capacity range covered by these two units is from 4,000 to 120,000 lb per hr. The two units below are custom designed for various capacity, pressure and temperature requirements up to 600,000 lb per hr, 1400 psi and 950 F. All these units are pressure fired and do not require induced draft fans.

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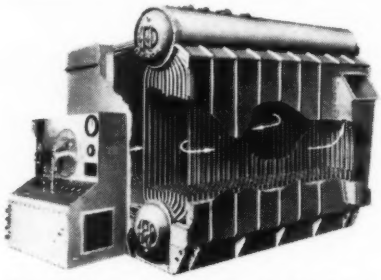
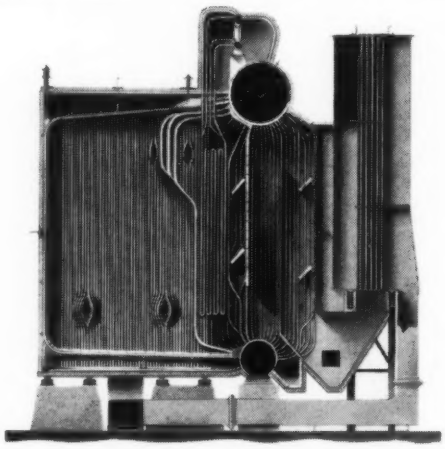
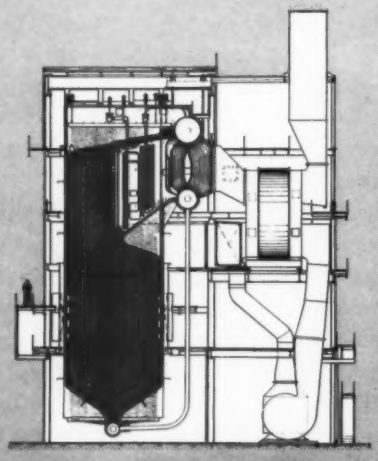


C-E Package Boiler — Type VP Completely shop assembled . . . available in fourteen sizes from 4,000 to 40,000 lb capacity . . . pressures to 500 psi. Available with integral console control panel, this unit contains more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. It can be equipped with any of several approved burners.

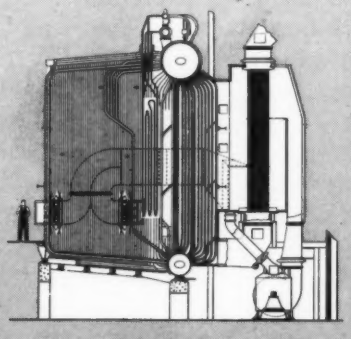


C-E Vertical Unit Boiler — Type VU-55 Available in six sizes . . . capacities from 50,000 to 120,000 lb steam per hour . . . designed for two pressure ranges, 250 psi and 500 psi, and total steam temperatures up to 750 F. This double cased, gas-tight unit is equipped with tangential burners. A large (60-inch) steam drum assures generous water capacity and steam reservoir space. Tangent tube waterwalls offer complete furnace protection, minimizing maintenance.



C-E Vertical Unit Boiler — Type V2

This unit is available for capacities from 200,000 to 600,000 lb per hr. It can be designed for pressures up to 1400 psi and for temperatures to 950 F. Tilting tangential burners, providing superheat control, are standard equipment although horizontal burners are available, if desired. A double, gas-tight casing assures lifetime tightness and minimum heat loss. Heat recovery equipment can be furnished as desired.



C-E Vertical Unit Boiler — Type VU-50B

This unit is available for capacities from 50,000 to 400,000 lb per hr—pressures to 1400 psi and temperatures to 950 F. This bottom-supported design uses tilting tangential burners providing effective superheat control. Horizontal burners can be furnished if desired. Heat recovery equipment as required. This unit makes available to industrial installations a standard of performance comparable to utility practice.

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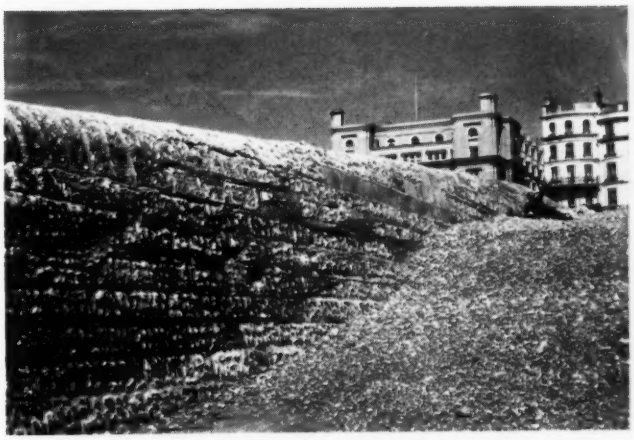
It must be kept in mind, though, that our group visited only a few offices of more than 400 members of the British Association, and those were among the largest and most distinguished firms in England. There must be members whose offices are less impressive. There are, no doubt, many British consultants who, like their American contemporaries, have their dignity blasted occasionally by far from subservient demands by contractors and architects.

The group left England feeling that they had learned something about the business, professional, and technical aspects of the private practice of engineering in that nation. And even if the Russians did not, we certainly did see ravens around the Tower of London.



PEBBLE BEACH AT BRIGHTON WAS BUILT UP BY THE ERECTION OF THESE GROINS FROM BOARDWALK INTO THE SEA. GROINS ARE CONCRETE. FACED WITH STONE.

Three Days in Holland

The Dutch are excellent planners. As we walked into the door of the hotel in Amsterdam, there were two genial gentlemen waiting for us, notebooks and mimeographed programs in hand. Ir. J. P. Heederik, a consulting civil engineer took notes, while Mr. B. J. Max, a heating, ventilating, and air conditioning consultant, handed out mimeographed sheets headed, "Orde van Nederlandse Raadgevende Ingenieurs—Program." And quite a program they had arranged.

On the first day of the visit, we had luncheon with members of the Association who had come to Amsterdam from The Hague, Rotterdam, Utrecht, and other more distant cities.

This being the first visit of our group to a country with a different language, we were afraid that we might have trouble in communication, but not at all. Every member present spoke enough English for us to have no trouble in simple conversation, and technical discussions were, if anything, even easier. Perhaps both the Americans and the Dutch used their hands more in conversation than we would have in conversing with our own countrymen, but no points went unexplained.

At the luncheon, plans made by the Dutch consultants were explained, and assignments were given out for individual meetings the next day. For example, William Moore, of Dames & Moore, the California soil mechanics consultants, was to be taken by one of the Dutch engineers to the Soil Mechanics Laboratory at the University of Delft. Duffill was to go with Ir. J. P. van Bruggen to inspect the harbors and shore protection installations at Amsterdam. Each member of the American group was assigned to one or more of the Dutch engineers whose work corresponded to the U.S. consultant's principal field of interest.

After the luncheon the group was driven, in private cars, to Rotterdam, for a visit to *Bouwcentrum* or Building Trade Center, which now houses a permanent display of commercial building materials. Since many of these materials and the construction methods on display were new to the Americans, we found it most interesting and educational. The Dutch engineers, however, many of whom had not previously visited the building, were rather doubtful of its value from their point of view. As one of them put it, "The client or the contractor comes in to the exhibit, looks it over, and decides he wants this thing or that thing in his new building, and he has no idea of its adaptability to the particular project. So we have to spend our time trying to explain to him that the stuff just does not fit his specific needs."

The Dutch did admit that there was some good research work being done by the *Bouwcentrum* that could result in improvements in construction materials and methods. This center is a semi-government institution, and the Dutch consultant, just like the consultant in the U.S., looks with doubt on government financed projects of this nature.

We each departed separately the next day for visits with the engineers to whom we had been assigned. My experiences were probably typical of those in the American group. Early in the morning I caught a train from Amsterdam to The Hague to meet Ir. J. A. van Heerde, a civil consultant. (The Ir. is an abbreviation for Ingenieur, and is used by all graduates in engineering from the Technical University of Delft. It corresponds roughly to our use of P.E.)

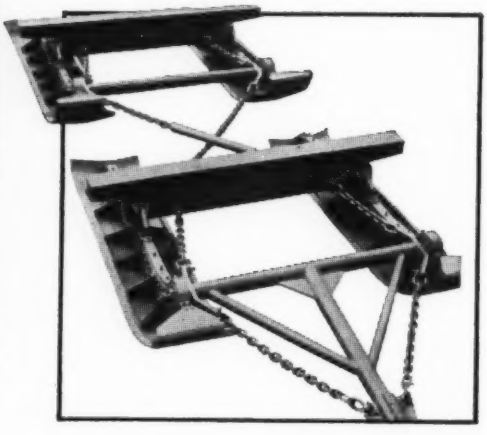
Currently, van Heerde is in charge of the design and supervision of construction of a large office building for the government. It will be occupied by offices of the Department of Agriculture and some portion of the Air Force. The building is about 70 percent complete and is an excellent example of large office building design. Van Heerde pointed out that the principal problem in design had come about through a change in plans by the government after

Operation Deepfreeze sleds plow across Antarctica on tough skis of USS "T-1" Steel

IGY IS THE REASON. Scientists with the current Navy expedition to Antarctica will obtain scientific data on weather, atmospheric conditions, aurora and air glow, glaciers, geomagnetism, and allied subjects during the next International Geophysical Year (1957 and 1958). Tractor-drawn trains of cargo sleds, built by Otaco, Limited, Orillia, Ontario, Canada, will be used to haul supplies. Skis for the sleds are made of USS "T-1" Steel.

THE SKIS ARE MADE OF USS "T-1" STEEL. When the going gets rough, the runners on these cargo sleds are assembled into skis, 13 feet long and 34 inches wide, made of USS "T-1" Steel.

DURING OPERATION DEEPFREEZE, the Navy's current expedition to Antarctica, thirty-eight rugged cargo sleds will be used to haul supplies 400 miles from Little America to Marie Byrd Land. The 11-ton sleds, each carrying a load up to 20 tons, ride on skis made from tough ¼" plates of USS "T-1" Steel. The sleds were designed jointly by the United States Navy and Otaco, Limited, Orillia, Ontario, Canada.



Naturally, the skis had to be made from a steel that stays tough and durable at temperatures far below zero. The steel also had to possess high strength (to keep down weight), and excellent resistance to abrasion (to withstand the 400-mile trip across rugged, ice-covered terrain). In addition, the steel had to have good forming characteristics and be easily weldable (to simplify fabrication).

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the building was well under way. At first the government had stated that the building was to be constructed without interior walls for the main office areas, movable metal partitions to be installed as separations between offices. Then, after all the structural design had been completed and the construction had begun, the powers in the government Departments decided they wanted permanent walls instead of movable partitions. This meant that the plans had to be completely redrawn and some type of material had to be specified for the interior walls that would satisfy the government as permanent while still being light enough so that the added weight would not necessitate tearing out the portion of the building already complete in order to strengthen the foundations and columns.

He found the answer in a lightweight hollow tile.

While this sounded like a typical problem of any consultant in Peoria or Tulsa, there were some aspects of building construction that differed considerably from common practice here. There was a lot more plastic pipe and conduit used than we generally see. Also, all the electric distribution cable in the building was carried in overhead, cantilever, concrete troughs extending from each side of the corridors. These troughs being open at the top, the wiring is easily accessible, yet the appearance from below is pleasing.

A portion of the basement is built as a bomb shelter, with the small windows fitted with large studs on each side to which iron covers can be bolted. As he pointed out this feature, van Heerde said, "No good, obviously, for an atomic bomb, but who knows, maybe they will still stick to ordinary bombs for awhile in the next one."

We had lunch at a seaside hotel, van Heerde eating very lightly, and explaining that he had been a light eater since his two years in a German concentration camp following his capture when he was a member of the Resistance during the war. Both he and his wife had been decorated after the war by the U.S. and British governments for their part in the Resistance movement.

After lunch van Heerde drove me to Rotterdam, and turned me over to Ir. H.H.W. van Eyk, a mechanical engineer, specializing in air conditioning, heating, and refrigeration, who took me on an inspection tour of two cold storage plants he had designed and a new laboratory and pilot plant building of Unilever, the international operation of Lever Bros., for which he had designed the heating and air conditioning. All of these projects were excellent, the controls and instrumentation of the larger cold storage plant being particularly outstanding.

From Rotterdam, van Eyk drove me to The Hague, where we met the President of the Association, Ir. J.A.G. van der Steur, and the Secretary, Ir. H. Rusting Ir. Rusting is also a member of the Executive Committee of FIDIC. We drove to Amsterdam, and had an excellent dinner at a fine restaurant overlooking one of the canals. Both van der Steur and Rusting were somewhat disturbed by the gondola the owner of the restaurant had parked in the canal in front of the establishment. They felt that it was inappropriate and lacking in national pride for the proprietor to adopt an Italian motif to attract customers to a good Dutch eating house.

At this dinner, with just the three of us present, I learned more about the operations of European engineers and about their ideas of Americans and American engineers than at any other time during the tour. The conversation following dinner was intimate and enlightening, for Rusting is rather an expert on the operations of consulting engineers in all the countries of Europe, as the result of his many years of work on committees of the International Federation. After this conversation, I felt sure that the qualifications, ethics, professional practices, and business methods of independent consulting engineers in Europe and in the U.S. are much the same. In fact, differences are likely to be as great from one office in Manhattan to another, or from one office in London or Amsterdam to another, as they are across the Atlantic.

The next morning, early, a bus was waiting outside the hotel to take the Americans and several of the Dutch engineers for a tour of the Zuiderzee reclamation works. This tour started from one of the towns, Lelystad, built on the new lands. We continued from there on a government motor launch that had been put at our disposal. Aboard this boat we visited the dykes now under construction and the enormous dredging operations in the Zuiderzee (which now that it has been closed off from the North Sea and has become fresh water as a result of the inflow of the Rhine, and is no longer called the Zuiderzee, but the Ijsselmeer). Landing on the other side of the Zuiderzee, we were met by the bus, which drove us through one of the recently reclaimed Polders, across the enclosing dam (which is 18 miles long with a four-lane highway along it and locks to the North Sea at each end), and back to Amsterdam by a road leading through miles of tulips in full bloom.

Next day the group left for Germany with the feeling that any compliments concerning the hospitality of these engineers of the Netherlands could be nothing but understatements.

Visit in Germany

The German consultants managed to be even one step ahead of the Dutch in greeting us at the airport rather than at the hotel. It was almost noon when we arrived in Dusseldorf, and by 1:00 pm, we were at lunch with them in the Breidenbacher Hof, one of the city's finest hotels. The wives of the U.S. consultants were invited to this luncheon, after which the men gathered in another room for a dis-

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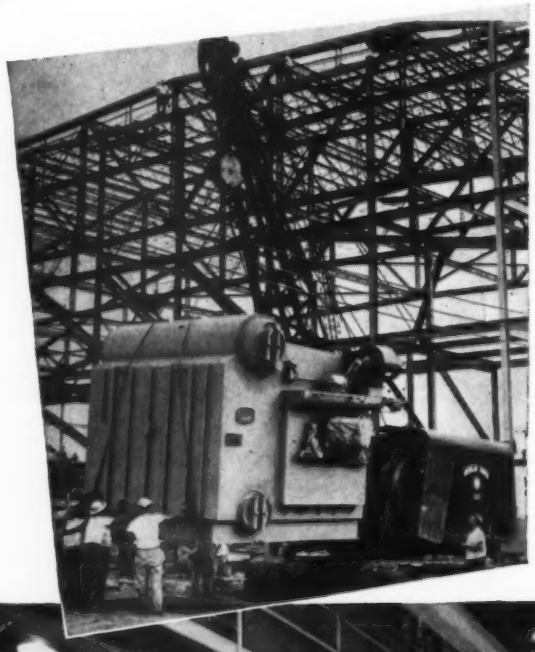

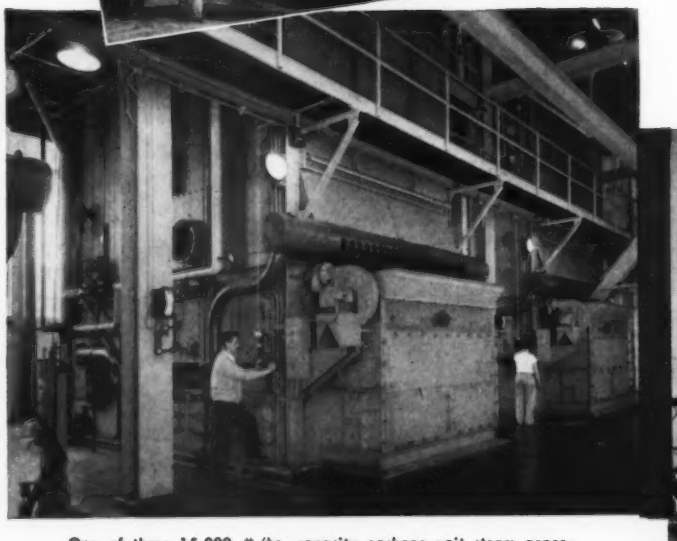

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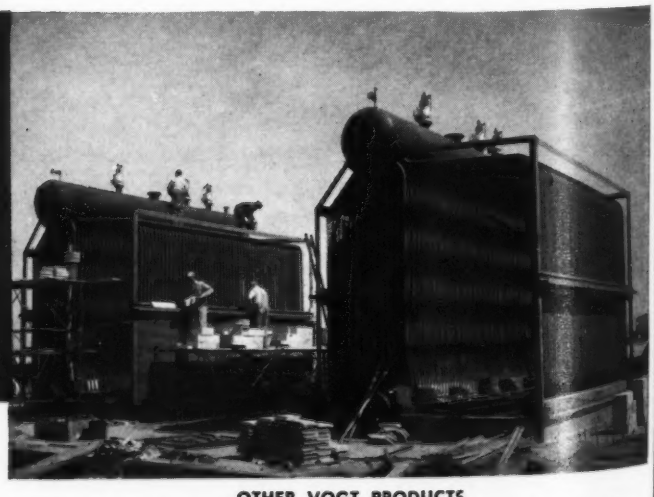

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cussion of private practice in Germany and the United States.

This was our first experience in the use of an interpreter. Actually, most of the German engineers understood conversational English—and spoke some English—but it was felt that everyone present could understand the discussion better if an interpreter was used. Dr.-Ing. P. Walter, representative of the president of the German Association, has two sons who speak English. One is an engineer in business with his father, while the other is a medical doctor, who spent three years at the University of Michigan, and is more apt at U. S. colloquialisms than most of us. These two young men translated from German to English and from English to German with ease, so despite the extra time required for interpretation, there was no question as to the thoroughness with which the two groups exchanged ideas.

The German engineers stated that one of their principal problems came from competition with the large manufacturers who gave "free" engineering with the sale of equipment. They confessed that they had found no solution to this problem, but they were hopeful that their Association could, in time, conduct an educational campaign that would prove to the clients that they could get the best work at the best price only through the services of an independent consultant. They also are plagued by the refusal of the government to use consulting engineers on highways, bridges, or government projects. Government highway department engineers and engineering employees do this work.

Mr. William Moore, President of the California Association of Consulting Engineers, told how the independent consultants in California faced the same problem, there now being a constitutional provision in California prohibiting the use of consulting engineers on state projects. Moore said that the California Association had helped in having a study made by a legislative committee in which it was proved that it was less expensive to use outside consultants than to use state employees for this type of work, and as a result, an amendment to the constitution was being put before the people to permit the engaging of outside consultants on state projects. It was suggested that a cost study by the German government might show the same cost situation there.

The Germans have no state registration for engineers, and they showed interest in the way in which our registration laws were promulgated and enforced. They seemed to feel that some sort of registration would be good for the profession.

They said that all too many unqualified men had taken up engineering under the Occupational Government. The British, French, and U.S. authorities had, certainly in the beginning, demanded too little in the way of proof that a man who held himself out to be an engineer really was one. All too often they had accepted as qualified professionals, men who claimed their records and proofs of qualification had been "destroyed" during the war. Currently, one of the best ways to be sure of an engineer's qualifications is his membership in the Association, but here again, Dr.-Ing. Walter estimated that perhaps only a third of those qualified actually belong. The Association is anxious to increase its membership by bringing in all the consulting engineers who are qualified and thereby strengthening the Association in its efforts to compete with the large manufacturers and contractors.

Again, in the evening, we had dinner with several of the German engineers and their wives and visited in their homes. Certainly, the wives of the American consultants felt that this was their finest hour, for it is the custom in Germany, much more than in other European countries, to include the wives in the activities of a visiting group.

The German engineers also arranged a day of visits to their projects and their offices. One of Walter's current projects is an enormous cement plant located between Dusseldorf and Essen. We spent part of the morning going over the site and then drove to Essen to visit several of the engineers' offices and a soil mechanics laboratory.

An interesting practice in the drafting rooms was the extensive use of color on original design drawings. Blue is used for steel, red for brick, orange for concrete, and other colors to identify various materials of construction. These colors show up merely as varying shades on the prints. Mr. Brooke, one of the U.S. consultants said that he remembered when the use of color on drawings was common American practice — perhaps 40-50 years ago. But then the color was drawn onto the originals with hectograph pencils, and the prints were made by gelatin transfers so that the true colors on the original carried over onto all of the prints.

Whether the variety of color is of any great practical value or not, it adds to the appearance of the originals. It also was noted that it is the universal practice of German draftsmen to turn their boards almost vertical and stand before them rather than work seated with the boards turned down as we do.

After the office visits, we were again the guests of the German consultants at a luncheon given in a fine restaurant overlooking the Ruhr River.

One of the German consultants, Alfred Popp, must have been assigned the task of acting as a special visitor's committee, or perhaps he took these duties upon himself. Throughout the visit, it seemed that if any of us had the slightest wish or the smallest question, there was Herr Popp, who seemed to appear in answer to even unspoken queries. As we gathered in the hotel lobby to leave for the airport, there was Herr Popp with violets for the ladies and warm handshakes for all the

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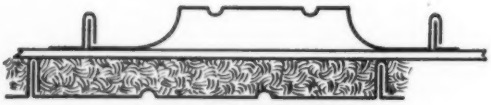

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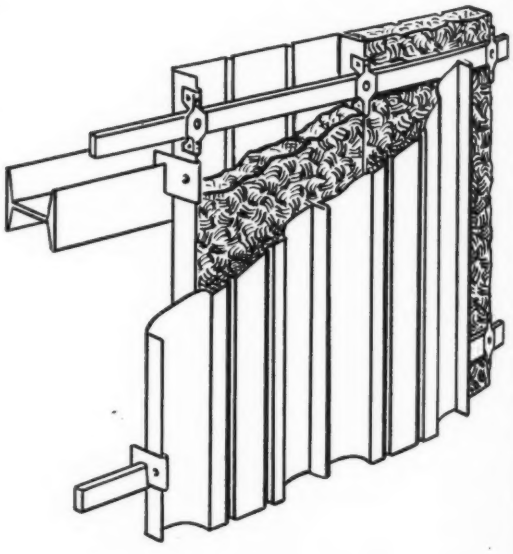

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men. Half an hour later, as we got on the airport bus, there was Herr Popp, anxious to do what he could to see us safely off. More than an hour later, as we started into the plane, the stewardess stepped aside to let Herr Popp, who had got there ahead of us, help the ladies up the steps. Everyone was perhaps a bit surprised on landing in Zurich not to find Herr Popp there to greet us.

Meetings with the Swiss

The Swiss, like the Dutch, depend to such a great extent on foreign contacts for their business that they are excellent linguists, and all of the Swiss engineers we met spoke English. Robert Naef, immediate past president of the International Federation of Consulting Engineers, worked for several years in England.

These engineers also had made plans for us. After leaving us one day free for shopping and sightseeing, Naef took the group on a full day's engineering tour of the area. The first stop was at a new Cantonal Hospital in Winterthur, where we were conducted around the partially completed building by the architect.

From there we visited the site of a new bridge across one of the smaller streams flowing into the Rhine. This is to be one of the world's largest stressed concrete bridges. The concrete is cast with the stressing cables in place inside of conduit. The conduit is positioned in a wave form following the stress pattern of the bridge. Concrete is then poured around the conduit, through which the cables run. After three days, tension is applied to the cables to stress the concrete. The tension is increased over a period of about thirty days, with checks made along the span to be sure that friction between the cables and the waved conduit does not prevent even application of stress.

The contractor's superintendent was on hand to explain the design of the bridge. It turned out that he had worked in the U.S. for Ford, Bacon and Davis for several years.

Leaving the bridge site, we had lunch in a restaurant overlooking the Rhinefalls, one of the most beautiful sights in the world. Then, the consulting engineer in charge of a new hydroelectric project took us to its site just below the falls of the Rhine. As the consultant explained, the problems at this location were largely political rather than technical. First, the Rhine separates Switzerland from Germany at this location, and past international agreements required that a specific percentage of the labor be Swiss and the remainder German. This agreement has to be followed exactly, so that it will be necessary to be extremely careful in the last few weeks of construction to see that just the right number of Swiss and the right number of German workmen are employed for the right number of hours.

Even more difficult was the handling of the political situation in Switzerland. Since this is a resort area, many of the Swiss objected strongly to the erection of the dam, fearing it would disturb the natural beauty of the Rhine and its valley. There was fear that the lake created by the dam would back water up to such a height that it would interfere with the Rhinefall, about 4 miles upstream. Also, the dam is placed across the river just ahead of a large horseshoe curve where it doubles back almost on itself. Water from above the dam flows through the turbines and then out through a pair of free-flow tunnels, cut through the narrow neck of land. The outflow is into the river at the other end of the horseshoe. It was felt that this by-passing of the water would leave the horseshoe bend practically dry, an unthinkable result, for this is a particularly beautiful stretch of river containing an island on which there is an historic monastery.

The engineers were able to convince the public that the fear of disturbing the Rhinefall was unwarranted, for the lake created by the dam would not rise enough to reach the level of the foot of the falls. The fear of drying up the horseshoe, however, was more serious, for the capacity of the turbines just about equals the flow of the river during dry seasons. This problem was solved by building two smaller dams around the horseshoe, thereby creating lakes that would maintain the level of the water in this bend even with very light flow. An agreement was made requiring that a small amount of water be directed over the power dam even at minimum river flow — just enough to make up for evaporation and to prevent stagnation of the water in the bend. Then, as soon as the river flow increases, the bend is to be flushed with the excess water.

It took years to convince the Swiss public that this plan would maintain the beauty of the countryside while still permitting them to harness two, 25,000 hp turbines, providing needed electricity for industry. It is expected that the plant will go into operation this fall. As the engineer pointed out, this was a relatively small project with a big public relations problem. He felt that on this job his primary difficulties had been political rather than technical.

The next day we had luncheon with the Swiss Association in the old Wine Merchants Guild. At one time the guilds were the most powerful political forces in Switzerland. Today, they are more like private clubs, memberships still passing, for the most part, from father to son. Naef was quite proud of his family's long connection with the Wine Merchant's Guild, and he took some good natured ribbing from the other Swiss, who made counterclaims for each of his claims of family honors. Finally, Naef informed a member of the Vinters' Guild, who had been claiming seniority, that it was obvious that the Wine Dealers were the smarter — they had to be to sell the poor wines forced on them by the vint-

ers. The American consultants had to disagree, for Swiss wines are certainly among the world's finest.

The luncheon lasted until nearly 4 pm, ending with a visit to the attic of the building to inspect new steel beams installed according to Naef's design. They assured, he said, at least another 200 years for the building.

Then Paris

We arrived in Paris late on a Friday evening, and with the intervention of Whitsunday and the following Monday holiday, it was Tuesday morning before we contacted the office of the French Association of Consulting Engineers. It was then we learned that the gentleman with whom we had been corresponding was no longer president of the Association. The current president is Mr. Gilbert Beau de Lomenie, *Chevalier de la Legion d'Honneur, and Conseiller du Commerce exterieur.* Arrangements were immediately made for a luncheon for our group at Cercle Republicain, an old distinguished club, on Avenue de l'Opera.

It was an interesting meeting. Very few of the French engineers spoke English, and the high school French of the visitors was totally inadequate. Therefore, the short social before the luncheon consisted largely of gestures and smiles with an occasional thought getting through in basic French or English. But at the luncheon, where there was opportunity for more order and formality, this minor difficulty was quickly overcome. The president, Mr. Beau de Lomenie, and Mr. G. Bory, who is vice-president and secretary of the International Federation, both speak English, and Mr. Bory immediately took over as interpreter. From that point on there was no problem. Perhaps language interfered with any hope of a subtle approach, but within a very few minutes, the discussion had reached a stage of intimate frankness never equalled on the trip.

"The French engineers would like to do business alongside independent American consultants."

"The Americans would like to do business with the French."

"Which is the closest way to the World Bank?"

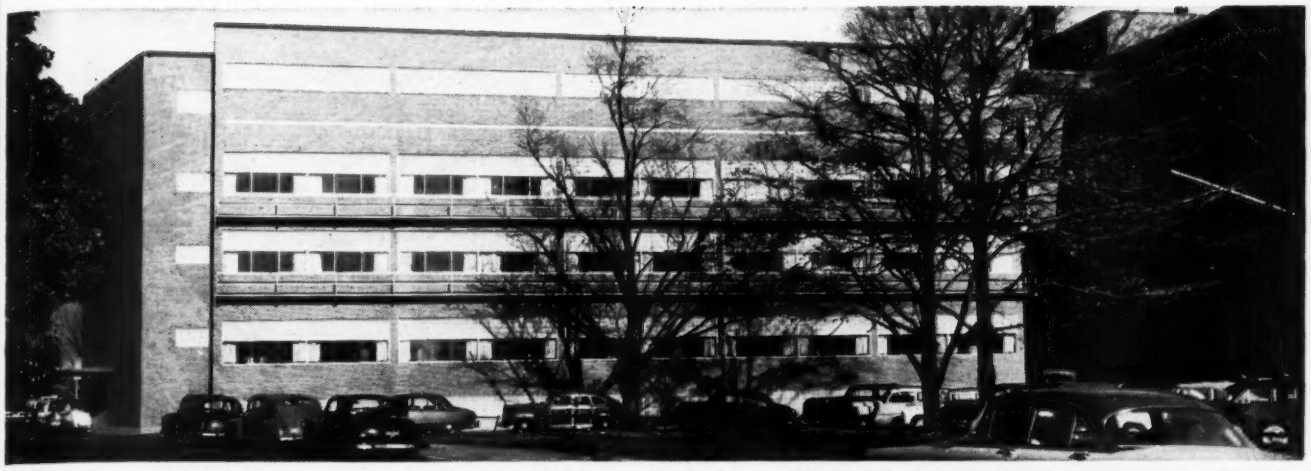
"You have some technical specialties and some financial connections that might be of interest to us."

"We have some business connections that might interest you."

"Perhaps if we work together we can meet our competition with force."

It was an interesting luncheon. Both groups will pursue it further by correspondence and personal visits. Mr. Beau de Lomenie had to leave the luncheon early, for he had business in Washington the next day and was catching the afternoon plane.

The French were not all business. These engineers were also delightful hosts and sincerely friendly. They were men you felt sure you would meet again — and hoped your feeling was right. ▲▲



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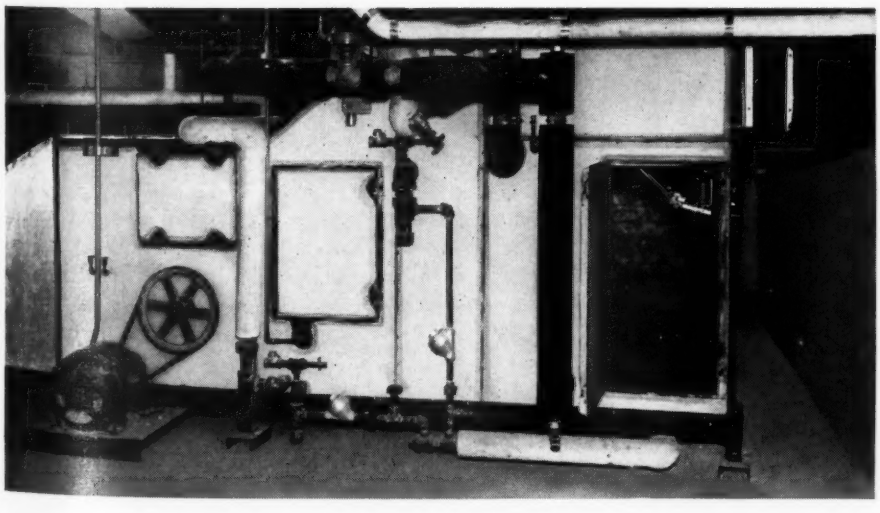

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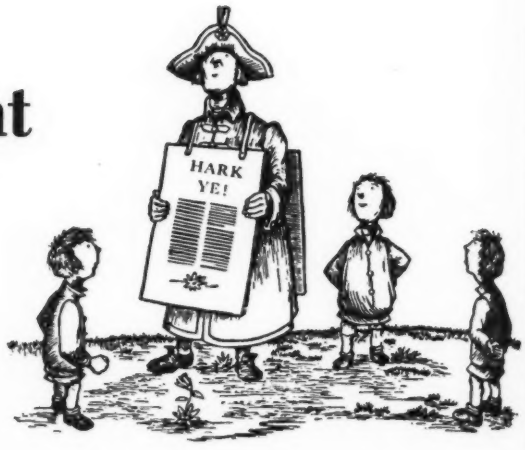
News for the Consultant



Intersociety Board Prepares Certification Requirements

The American Sanitary Engineering Intersociety Board, recently incorporated by members of the Joint Committee for the Advancement of Sanitary Engineering, has taken initial steps toward development of its certification process. Purpose of the ASEIB is to improve the practice of sanitary engineering, primarily by the issuance of certificates of special knowledge in the field.

The Specialty Committee, headed by Raymond J. Faust as chairman, expects to have the necessary forms and procedures in working order this month. Certification will be based on registration as a professional engineer with at least one State Board of Registration and graduation from an approved four-year college course. For certification as a Founder, 15 years of experience will be required. For engineers not qualifying as Founders, an examination will be part of the certification procedure, along with eight years of experience.

The first examinations are planned for early in 1957, with applications for Founders to be received until July 1, 1957.

Proposed National Federation Meets in Tulsa July 6-8

The National Federation of Associations of Consulting Engineers will convene at the Mayo Hotel, Tulsa, Okla., on July 6, 7, and 8. This meeting is called for the purpose of making formal ratification of the Constitution and By-laws as prepared by the Interim Steering Committee elected at the St. Louis meeting in October, 1955. The Consulting Engineers Association of Oklahoma will be the host.

The National Federation is the logical outgrowth of the meeting held last October and attended by representatives of all state organizations known to be in existence at that time. The meeting demonstrated the desire for and need of a national federation to coordinate work of individual state associations so that they would be more effective on a national level. The Constitution and By-laws were prepared with that in mind. State members are allowed partial freedom of action without reference to the National Federation, but are provided with the prestige and influence of a large group on a national scale. It is hoped that formation of this group of independent consulting engineers into a cooperative organization will improve the professional status of the practicing consultant to the level desired, while acting as a stimulus to members to conduct themselves in a professional manner.

The Founder Members, who will organize the convention, are:

Consulting Engineers Association of California
Chicago Association of Consulting Engineers
Colorado Association of Consulting Engineers
Gulf Institute of Consulting Engineers
Intermountain Institute of Consulting Engineers
Minnesota Association of Consulting Engineers
Missouri Association of Consulting Engineers
New York Association of Consulting Engineers
Association of Consulting Engineers of Upstate New York
Consulting Engineers Association of Oklahoma

Recognition will be made of all other state associations that have been formed, or that are in the formative process, and they will be asked to express their views. An opportunity will be given for any state organization to affiliate with the Federation. Any state that does become associated will be given a vote in the proceedings after the initial organization is formulated. Ten members are required for affiliation.

Consulting engineer associations wishing to participate should:

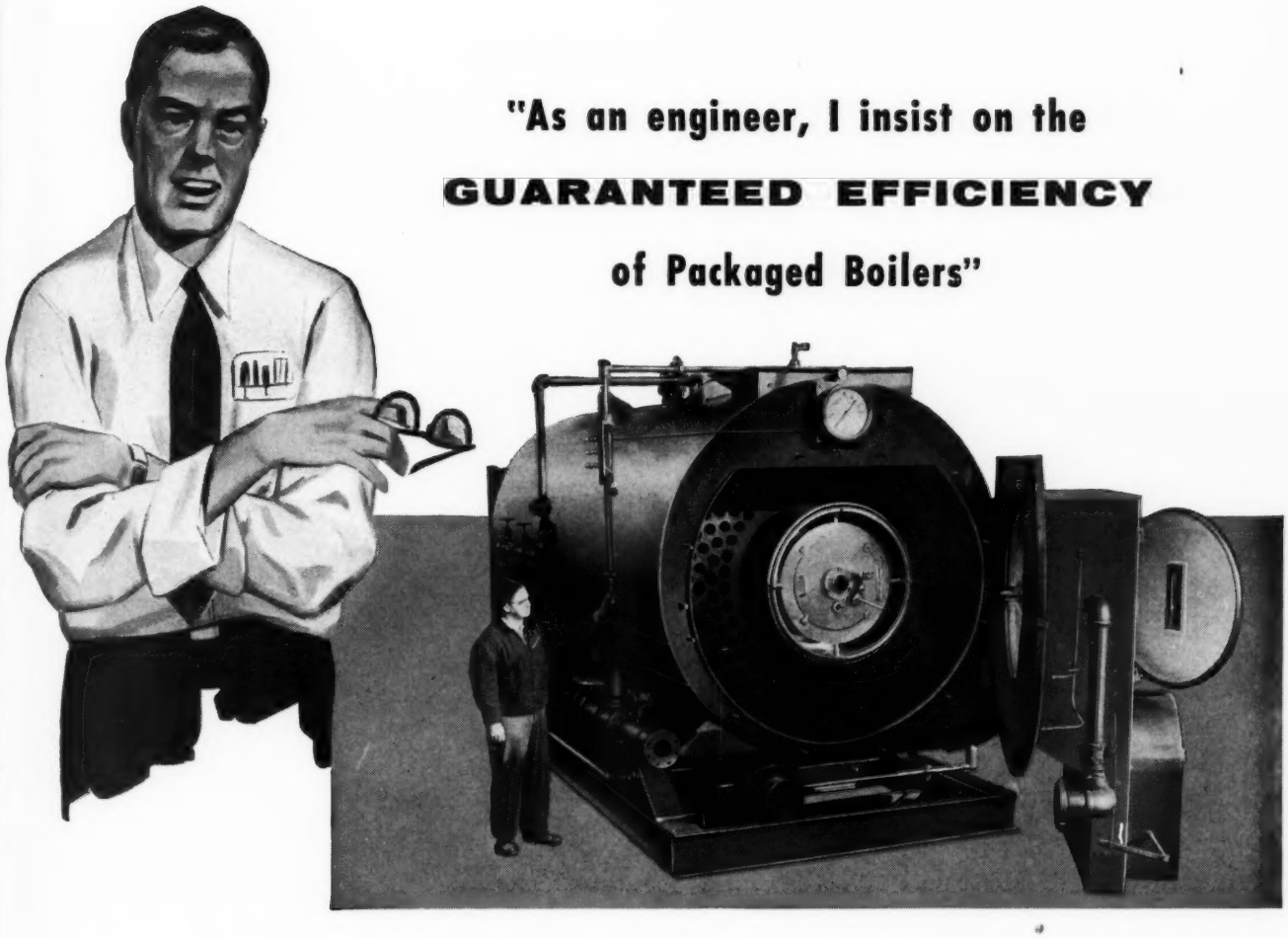
¶ Compile a certified list of membership. (The number of members determines voting strength.)

¶ Elect or otherwise designate a representative and an alternate to speak officially for the group. When affiliated with the Federation, this representative will act as a member of the Board of Directors.

¶ If possible, come prepared to ratify the Constitution. New organizations have one year to do this after application for membership, but the first year of the organization will be very important since the policies and procedure will be established during that period. The more members entering into these policy discussions, the less mistakes will be made.

¶ Mail these data to John K. M. Pryke, Chairman, Interim Steering Committee, Proposed National Federation of Associations of Consulting Engineers, 220 East 42nd St., New York, N. Y.

¶ Send a copy of the data to C. C. Pate, President, Consulting Engineers Association of Oklahoma, 208



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Peoria Plaza Bldg., 4129 South Peoria, Tulsa 5, Okla. ¶ Also enclose a copy of the association Constitution and By-laws, if possible.

Four more states, North Dakota, Oregon, South Carolina, and Virginia, have organized state-wide consulting engineer associations and plan to send representatives and delegates to the National Federation organization meeting.

It has also been reported that ten other states are in the process of organization and several of these plan to send observers.

Radioisotopes Used to Trace Sewage Dispersal

To insure against beach pollution when the modified Hyperion Sewage Treatment Plant is placed in operation, Hyperion Engineers traced dispersion of sewage effluent in ocean waters by means of radioactive isotopes. The engineering organization — a joint venture of Holmes & Narver, Inc.; Daniel, Mann, Johnson & Mendenhall; and Koebig and Koebig — is designing $40 million worth of additions and improvements to the Los Angeles sewerage system and the treatment plant.

The actual tracer experiment was conducted by Hyperion Engineers, Nuclear Science & Engineering Corp., treatment plant personnel, and the Hancock Foundation of the University of Southern California. Scandium-46 was mixed with effluent from the plant which was then discharged into the sea through the existing outfall. NS&E scientists aboard a laboratory ship took radioactive measurements at various depths and positions to determine dilution and rate and direction of diffusion.

The experiment had the approval of U. S. Public Health and Atomic Energy Commission officials as well as state and local health agencies. Radioactivity in the effluent was below the concentration permitted for drinking water as established by the National Bureau of Standards.

NSPE Considers Ideal Registration Law And Functional Sections

An Ideal Registration Law for professional engineers, now under consideration by the board of directors of the National Society of Professional Engineers, will be sent to each of the major engineering societies for review. The Law, presented to the board at the annual meeting in May, is an attempt to provide uniform standards of professionalism for engineers on a nation-wide basis.

Also adopted was an amendment to the NSPE by-laws to provide for creation of Functional Sections on a national level. The by-laws state that these sec-

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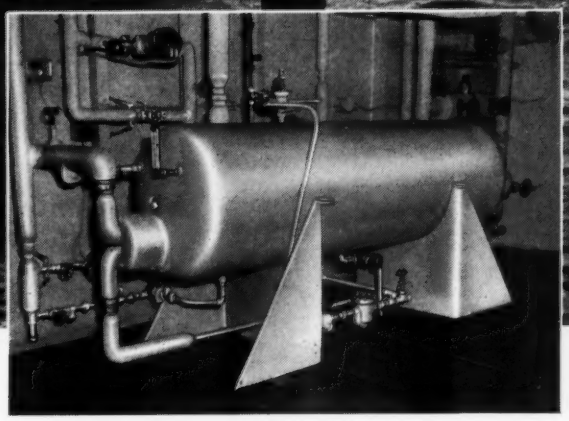

Somewhere off Cape Cod the first Air Force Radar island, called the Texas Tower, keeps a constant vigil against sneak enemy air attacks. Every piece of equipment on this steel island is on 24-hour duty. There's no let-up in demands. No time for breakdowns. Every item must work at peak efficiency around the clock—around the calendar.

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tions "shall be so conducted as to provide effective forums for discussion and united action on the part of members grouped according to type of professional employment, for the enhancement and betterment of professional recognition and status, and other matters of mutual welfare."

Engineers in private practice took advantage of the new by-law by forming the first national functional section for their own group. The consultants elected A. C. Kirkwood, of A. C. Kirkwood Associates, Kansas City, Mo., as chairman and formed a rules committee that will outline requirements for membership in the section. Consensus was that consulting engineers and their engineering employees be admitted for membership and that engineer-contractor firm members also be admitted. NSPE hopes that the state societies will follow through by organizing state-wide functional sections throughout the country.

Section Engineers Named For Turnpike Extension

The northern extension of the Sunshine State Parkway which will carry the Florida Turnpike from Fort Pierce to Tisonia, north of Jacksonville, has been divided into 19 sections, each of which will average 14 to 15 miles in length, in order to speed construction. Each section will be constructed under supervision of a different engineering company, as follows:

Bail, Horton and Associates, Bradenton, Fla.; Capitol Engineering Corporation, Dillsburg, Pa.; Marion-Carter, Inc., Vero Beach, Fla.; Brown and Blauvelt, New York, N. Y.; Glace Engineering Corporation, City of Treasure Island, Fla.; Ewin Engineering Corporation, Mobile, Ala.; Sherlock, Smith and Adams, Montgomery, Ala.; Hazelet and Erdal, Louisville, Ky.; Michael Baker, Jr., Inc.; Rochester, Pa.; Harry Balke Engineers and Rochester & Goodell Engineers, Inc., Cincinnati, Ohio; Tecon Engineers, Inc., Frankfort, Ky.; DeLeuw, Cather and Brill, New York, N. Y.; Palmer and Baker, Inc., Mobile, Ala.; Gannett, Fleming, Corddry & Carpenter, Delray Beach, Fla.; E. Lionel Pavlo, New York, N. Y.; Beiswenger, Hoch and Associates, Jacksonville, Fla.; Reynolds, Smith and Hills, Jacksonville, Fla.; and Smith and Gillespie, Jacksonville.

The section engineers will be in charge of grading, drainage, limerock base and roadbed, asphaltic concrete surfacing, and construction of all bridges and other structures in the area.

The Miami to Fort Pierce bob-tail Sunshine State Parkway has been divided into six sections with a special section for construction of the 3000 ft long St. Lucie Canal bridge — the largest on the Turnpike. Six of the seven section engineering firms on the bob-tail will be in charge of sections on the northern extension also.

Consulting engineers for the northern extension as well as the Miami to Fort Pierce section is the firm of Howard, Needles, Tammen and Bergendoff.

MEN IN ENGINEERING

August G. Sperl and W. B. Scheckel have announced formation of a partnership to engage in the general practice of consulting engineering. Name of the firm is Sperl-Scheckel Associates. Address is 441 Lexington Ave., New York.

Raymond J. Rosenberger has been named chief of the specification division of the Central District, The H. K. Ferguson Company, Cleveland, Ohio. He was formerly Cleveland office manager for Gilbert Associates.

W. A. Warrick, formerly chief construction engineer and deputy secretary for the Pennsylvania Department of Highways, has joined the firm of John Clarkeson, Consulting Engineer. He will serve as regional engineer for Clarkeson, in charge of all work for the firm in New York, Connecticut, and Pennsylvania.

The recently formed firm, O'Mara and Flodin, Inc., Engineers, has opened offices at 1111 Wilshire Blvd., Los Angeles, Calif. Main activity of the firm is in dust and fume control and drying and air separation fields.

Earl and Gropp, Electrical & Mechanical Engineers, have moved to larger quarters at 465 Geary St., San Francisco, Calif.

New officers of the American Institute of Electrical Engineers for 1956-57 year are: president, Mervin S. Coover, Iowa State College; vice presidents, Donald E. Garr, General Electric Co.; Leland F. Stone, General Electric Co.; F. H. Foote, Commonwealth Associates, Inc.; Norman F. Rode, Texas A&M; Mansfield M. Ewell, Westinghouse; and Henry H. Kerr, Toledo Edison Co..

Harry J. Bernat has been appointed a division manager of Kaiser Engineers Div. of Henry J. Kaiser Co.

Sir George Nelson, president of the Institution of Electrical Engineers, of Great Britain, and W. K. Brasher, secretary of IEE, were guests of honor at a luncheon given by Morris D. Hooven, past pres. of AIEE. Other guests included the presidents and secretaries of American engineering societies, representatives of English engineering industries and societies, and prominent American engineers.

J. H. Bertrand has joined Lester B. Knight & Associates, Inc. as manager-plant engineering, in the Chiago office.

BERTRAND LITTLE

J. M. Little & Associates, industrial designers, have established an engineering division that will operate entirely apart from the industrial design division and will serve clients for mechanical and electrical consulting engineering, specializing in the fields of machine design and general engineering.

The Tucson, Ariz. office of Johannessen and Girand, Consulting Engineers, has been moved to The Fiber Building, 15 E. Alameda, Tucson.

Of the 100 alumni of Polytechnic Institute of Brooklyn to receive Certificates of Distinction at the annual observance of Alumni Day, eleven are consulting engineers: Nomer Gray, Ammann & Whitney; George Lutz, George Lutz, Inc.; Harris Grand, Consulting Engineer; David G. Baillie, Jr., Singstad and Baillie; Irving L. Gelder, Cauldwell and Wingate; George F. Price, Hoffman and Elias, Inc.; E. J. Quirin, Frederic R. Harris, Inc.; Frederick J. Valentine, Jr., F. J. Valentine, Inc.; Gregory M. Dexter, Consulting Industrial

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The Minnesota Association of Consulting Engineers has elected Borge Nielsen, of Nielsen and Bruch, Consulting Engineers, president for the 1956-57 term. William D. Schoell, of Schoell and Madson, Civil Engineers and Surveyors, is vice president. Secretary is John T. Baker, of J. T Baker and Associates, Engineers, and treasurer is Robert L. Michaud, of the firm of Richard W. Evans. New board of governors members are Willis A. Jacus, William Strum, and L. D. Freedland.

Wesley Bintz has been elected president of the newly formed National Swimming Pool Institute, an organization covering all phases of swimming pool design.

Robert S. Pettibone, formerly staff engineer of Boddy, Benjamin & Woodhouse, Inc., has been appointed general manager and chief engineer of W. Hawley & Company, Detroit.

Dr. Foster Dee Snell, president of Foster D. Snell, Inc., has been reappointed by the board of the American Oil Chemists' Society as their representative to the Division of Chemistry and Chemical Technology of the National Research Council for 1956-59.

The California Society of Professional Engineers has elected Harvey A. Mylander, Water Supply Consultant, as president for the 1956-57 term.

Five new members have been elected to the board of directors of Fay, Spofford, & Thorndike, Inc., Boston, Mass. They are Burdette K. Beebe, Fozi M. Cahaly, Harold H. Jones, Edward C. Keane, and Leon B. Turner.

Michael Baker, Jr., Inc. has announced appointment of three new vice presidents: Don H. Graham, who will coordinate work on foreign projects; Wayne D. Meyers; and Frederick H. Awalt, who will remain in charge of the firm's Washington office.

The Southern Zone of the National Council of State Boards of Engineering Examiners has nominated Leo M. Odom, consulting engineer of Baton Rouge, La., as director. ▲▲

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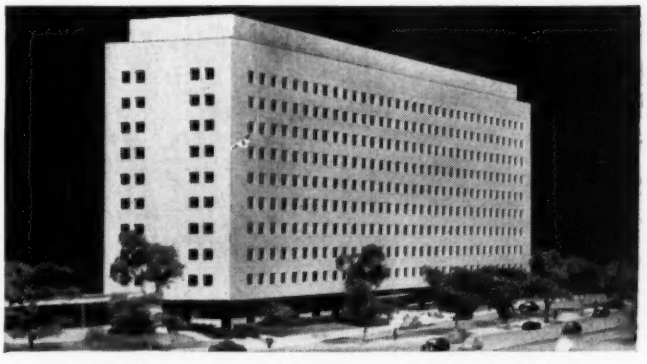

Electrifloor chosen for Dept. Property & Supplies Office Building, General State Authority, Harrisburg, Penn.
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Contractor: Ritter Bros.
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Notes FROM ABROAD

Use of Foreign Experts Cut

Utilization of the services of U.S. experts and technicians under the Indo-U.S. Technical Co-operation Program is under scrutiny by the Government of India, which asked all state governments to supply a complete list of needed foreign experts on agriculture, animal husbandry, fisheries, forestry, and allied fields. The list was to include experts needed by the governments and private organizations such as universities, agricultural colleges, and commercial firms.

The note also stipulated that foreign experts should not be asked for unless absolutely necessary and that requirements should be related to some specific project in a field where Indians of the necessary caliber are not available. In all other instances, special certificates of need must be issued, presumably by the state

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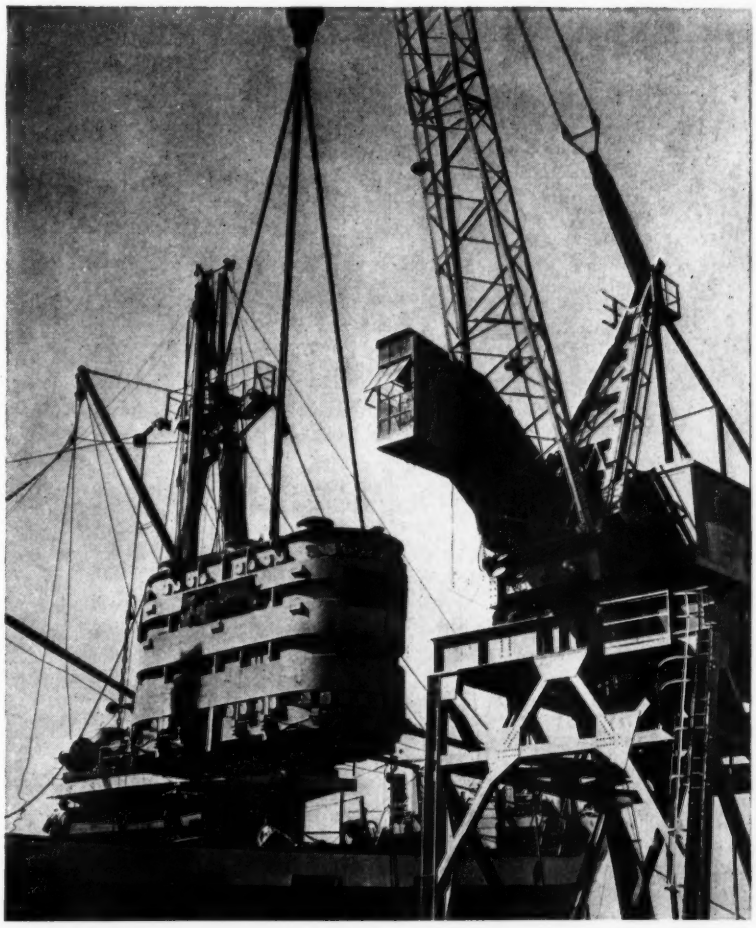
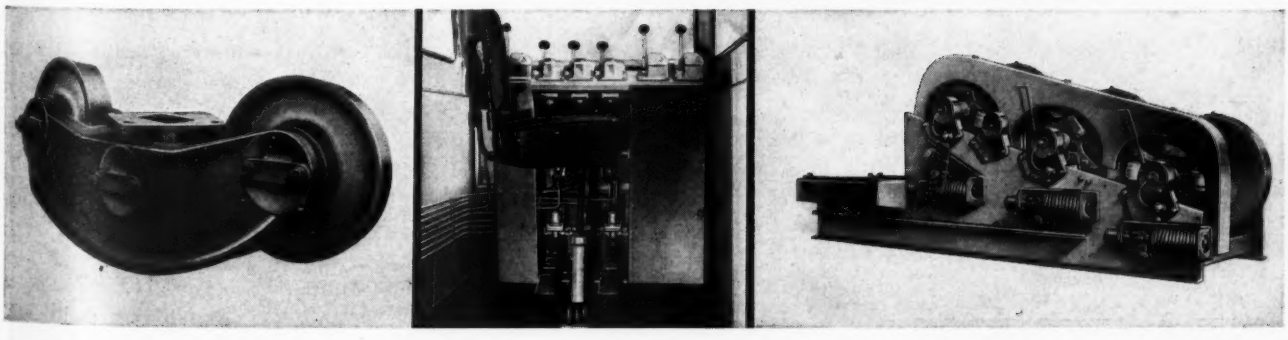


The progressive Port of Milwaukee offers the heaviest cargo handling facilities of any port on the Great Lakes. Cargoes of every description are funneled through this busy harbor for rapid and safe loading on ships bound for other lake ports as well as for overseas.

This time and money saving service is made possible by a huge Clyde Whirley that easily picks up loads in excess of 70 tons, smoothly swings them over a ship and gently places them on dock or in hold. Running back and forth on wide gage tracks, little of the valuable dock space is required for the Whirley to operate on. Loaded trains pass through the open portal of its gantry without interruption. The full revolving 100 foot boom handles capacity loads without any upward stress on center pin or gantry.

The design advantages and advanced engineering principles in Clyde Whirleys give them unchallenged superiority in the cargo handling field.



Only Clyde's equalized wheel arrangement on rotating structure permits safe and definite determination of wheel loads. Greater economy is effected through less maintenance and replacement.

Fatigue-free operation means faster working cycles and more materials handled. Operator's cab designed to provide utmost comfort as well as complete vision.

Ball and roller bearings throughout on Whirley hoists cut power consumption and permit higher operating speeds. Clyde's air operated friction clutches and brakes assure safe, smooth and accurate load control.

WRITE FOR FREE BULLETIN 12 FOR COMPLETE WHIRLEY INFORMATION

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government, and arrangements must be made to have Indian personnel understudy the foreign expert so that they will be able to take over the work.

The sponsoring authority is to be responsible for such local costs as: office space, equipment, furnishings, and supplies; stenographic, secretarial, translation and interpreting service; technical assistance; transportation within India along with proper identification papers for travel; and adequate housing at reasonable rental.

Proposals of private organizations and firms must be supported by appropriate departments of the state government with a certificate that arrangements have been made to cover the local costs.

Criticize Bidding Procedure

The Snowy Mountains Hydro Electric Authority passed up bids by nine British firms for seven main power transformers, and instead awarded the $2 million contract to the Belgium firm of Ateliers De Constructions De Charleroi, despite a 12½ percent tariff preference in favor of the British bidders. Of the nine British firms bidding, seven tendered identical bids with the remaining two differing only in minor details. A spokesman for the Authority said the British manufacturers' custom of tendering identical bids was objectionable since it was opposed to the whole idea of free competitive tendering for public contracts.

Curtain Wall in Australia

Australia's largest office building, being erected at North Sydney for the Mutual Life & Citizens Assurance Co., will have 250,000 sq ft of floor space to provide for 3000 office workers. Of lightweight construction, it will have glass and aluminum curtain walls and double glazed windows. The floors are interlocking galvanized steel units or "pans" that require only a light skin of reinforced concrete. Vermiculite will provide a fireproof shield for the structural steelwork and curtain walls. Consulting engineers for the project are Julius Pool & Gibson, of Sydney, Australia.

HOW TO USE HALLOWELL ADJUSTABLE SHELVING IN YOUR PLANT

SELECT THE BASIC SHELVING UNIT

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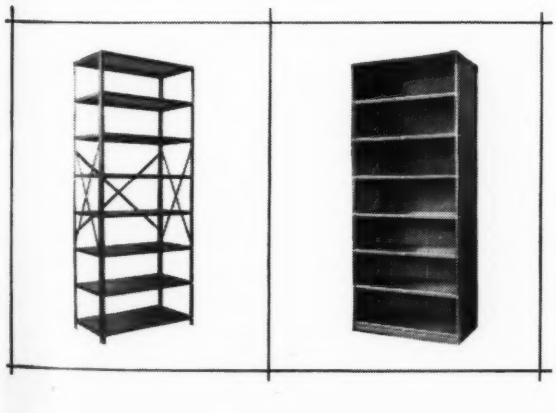
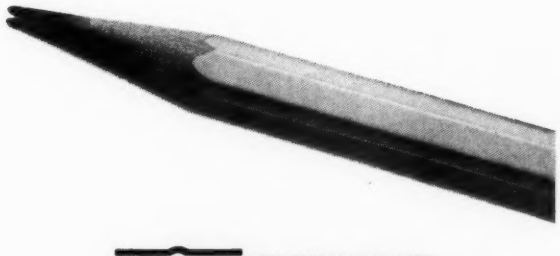
ADD SLOPING SHELF UNITS AND SHELF BOXES

PUT IN DRAWER INSERTS

ATTACH SLIDING OR SWINGING DOORS





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New Projects Reported

By Consulting Engineers —

CALIFORNIA

Golden & Bryant. Sewage disposal plant. $600,000. Client, City of El Centro.

W. H. Hermes, III and Geo. W. Dunn, Associate. Courthouse, jail, office building, and law library for County of San Diego. All except jail air conditioned. $2,200,000 mechanical ($10,000,000 total). Client, Architect.

Storage facility for 11th Naval District, 75 F and 45% RH at all times, 560,000 cu ft. $180,000 mechanical ($800,000 total). Client, Architect.

Jewish Community Center, San Diego. $158,000 mechanical ($650,000 total). Client, Architect.

Rehabilitate and remodel BOQ, N.S., 11th Naval District. $6000 mechanical ($39,000 total). Client, Architect.

New S.D.T. & S. Bank, San Diego. Air conditioning and plumbing. $20,000 mechanical ($200,000 total). Client, Arch.

John E. Rowland. New ultra-modern meat abattoir and dry rendering plant. Also, larger coolers to hold about 1000 cattle. $500,000 (est.). Client, Acme Meat Co., Inc., Los Angeles, Calif.

Michael J. Garris. Title Insurance Company, Santa Ana. $700,000. Client, McFarland & Bonsall.

BCA Building, Los Angeles. $500,000. Client, John Lindsey.

Sport Arena, Los Angeles. $700,000. Client, Stiles & Robert Clements.

Nurses residence, Los Angeles. $400,000. Client, Adrian Wilson & Paul Williams.

Iorner Plaza, Santa Ana. $800,000. Client, Barondon Corp.

Geo. J. Fosdyke, Structural & Civil Engineer. Structural and architectural design for reviewing theater and sound dubbing building, Los Angeles. Especially designed for 20th Century's new 55mm cinemascope film productions. Tilt-up panels of reinforced concrete are 29 x 33 ft and 5½ in. thick. $440,000. Client, 20th Century Fox Film Corp.

Green & Erskine. Administration building, Half Moon Bay Airport, Half Moon, Calif. $40,000. Client, County of San Mateo, Calif.

Branch library. $40,000. Client, City of Redwood City, Calif.

Health center. $100,000. Client, County of San Mateo, Calif.

Raymond E. Layton. Design and supervision of construction on a 100-ton-per-day paper mill using waste paper as raw stock. $1,500,000. Client, American Forest Products Corp.

Design and supervision of construction of several metered off-street parking lots. $150,000. Client, City of Hayward.

Structural design only on bank building in Stockton, Calif. $250,000. Client, San Joaquin Savings & Loan Assoc.

George S. Erskine & Associates. U. S. Navy facilities at Centerville Beach and Point Sur, Calif. Design of steam generation plant and underground distribution, all plumbing, heating, and ventilating, and electrical system including 12,000 v electrical distribution system and 312 kva standby generator for each project of 13 buildings. $1,250,000 each project. Client, U. S. Navy.

COLORADO

Harold Hoskins & Associates. Water treatment plant and distribution mains. $325,000. Client, City of Canon City.

Sewage treatment plant. $425,000. Client, City of Greeley, Colo.

Water tank and supply line. $150,000. Client, City of Sterling, Colo.

Curb, gutter, paving, and storm sewers. $165,000. Client, City of Sterling, Colo.

Tipton and Kalmbach, Inc. Roberts Tunnel — 25-mile long tunnel to be driven under Continental Divide. $36,000,000. Client, Denver Water Board, Denver, Colo.

CONNECTICUT

R. S. Loomis. Foundry addition, Hartford, Conn. $50,000 to $60,000. Client, Philbrick, Booth & Spencer.

Willimantic State Teachers College, women's dormitory, Willimantic, Conn. $200,000 (est.). Client, Kane & Fairchild, Architects.

Bridgeport First National Store, Bridgeport, Conn. $200,000 (est.). Client, Kane & Fairchild, Architects.

Sullivan Tool & Die factory building, Hartford, Conn. $110,000 (est.). Client, Kane & Fairchild, Architects.

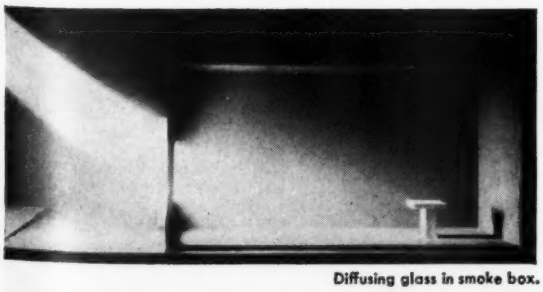
FLORIDA

Howard, Needles, Tammen & Bergendoff. Florida Turnpike Project No. 2, Fort Pierce to Jacksonville. $185,000,000. Client, Florida Turnpike Auth.

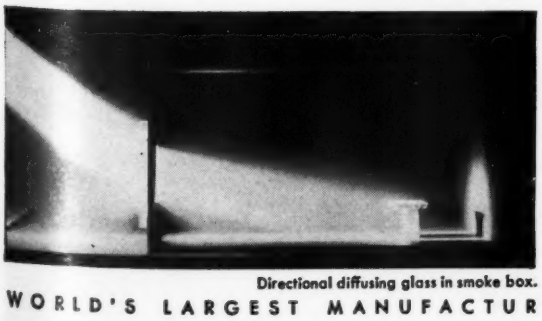
Ballinger-Meserole Co. Design of distribution center near Pensacola, Fla. with 1,000,000 sq ft of floor space to serve urban and rural stores within 160 mile radius. Client, The Lewis Bear Co., Inc., Wholesale Distributors.

THERE'S MORE TO *daylight* THAN MEETS THE EYE

"Smoke Box" photo—window glazed with clear glass.



Diffusing glass in smoke box.



Directional diffusing glass in smoke box.

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Good daylighting can be achieved with a handsome, modern, diffusing pattern which disperses softened light deep into interiors, provides comfortable, even illumination without harsh glare and sharp contrasts that cause costly eye fatigue. And if excess heat is a problem, keep interiors more comfortable with Mississippi Coolite, heat absorbing, glare reducing glass, which absorbs up to 50% of solar heat rays.

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Design of general office, warehouse, and service building, Key West, Fla. Reinforced concrete and concrete block designed to withstand hurricanes. $250,000. Client, Utility Board of the City of Key West, Fla.

ILLINOIS

Roberts and Schaefer Co. and Rummel, Klepper, and Kahl (joint venture). Complete design and supervision of construction of 9.7 miles of Tri-State Toll Road. $7,900,000. Client, Illinois Toll Highway Commission.

IOWA

Ralph W. Gearhart. Complete new waterworks, consisting of water supply well, pump, pump house, elevated storage tank, pipe line, including fire hydrants, valves, castings, and service connections. $55,000. Client, Libertyville, Iowa.

Brown Engineering Co. Power plant addition, 44 mw unit, 1250 psig, 950 F, for Prairie Creek Power Station. $7,500,000. Client, Central Iowa Power Co-op, Cedar Rapids, Iowa.

Heating and power plant, Iowa State Reformatory, 400 psig, Anamosa, Iowa. $1,000,000. Client, Board of Control of State Institutions, Des Moines, Iowa.

NORTH DAKOTA

Carlson Engineering Co. Minot Savings & Loan Building. $27,000 electrical ($170,000 total). Client, A. M. Ulvestad, Architect.

New headquarters building for Slope Electric Corp., Inc., New England, N. D. Electrical, including electrical heating. $100,000. Client, A. M. Ulvestad, Arch.

Gausman & Moore, Inc. Annunciation Convent—school, convent, and Motherhouse, Dickenson, N. D. $1,000,000. Client, Marcel Breuer & Traynor & Hermanson, Associated Architects.

K. B. MacKichan & Associates. Swimming pool. $55,000. Client, City of Linton, N. D.

Soil cement paving. $200,000. Client, City of Cavalier, N. D.

Sewerage and water system. $150,000. Client, City of Souris, N. D.

Sewerage system. $70,000. Client, City of Edinburg, N. D.

Sewerage and water system. $200,000. Client, City of Adams, N. D.

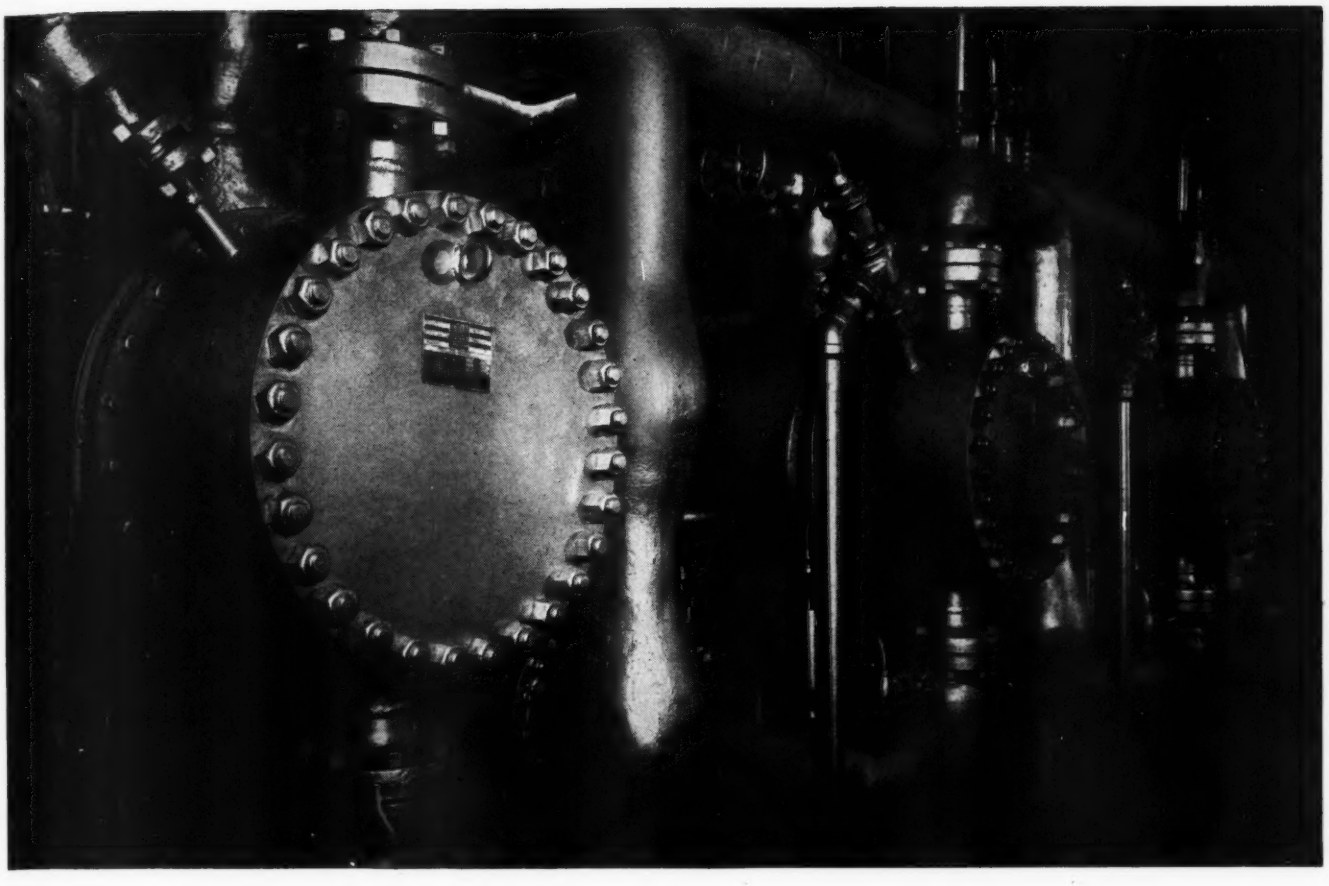
OHIO

Willard F. Schade & Associates. Sewage treatment plant. $333,814. Client, Village of Twinsburg, Ohio.

Gustave M. Goldsmith. Car wash building, 28 x 120 ft, one-story, masonry-steel roof, Kenwood, Ohio. $25,000. Client, Howard E. Deters.

Hixson, Tarter & Associates. Warehouse and office building, Solon, Ohio. $3,500,000. Client, The Kroger Co.

W. B. Huff & Associates. Doylestown elementary building—12 classrooms, 2 kindergartens, kitchen, offices, multi-



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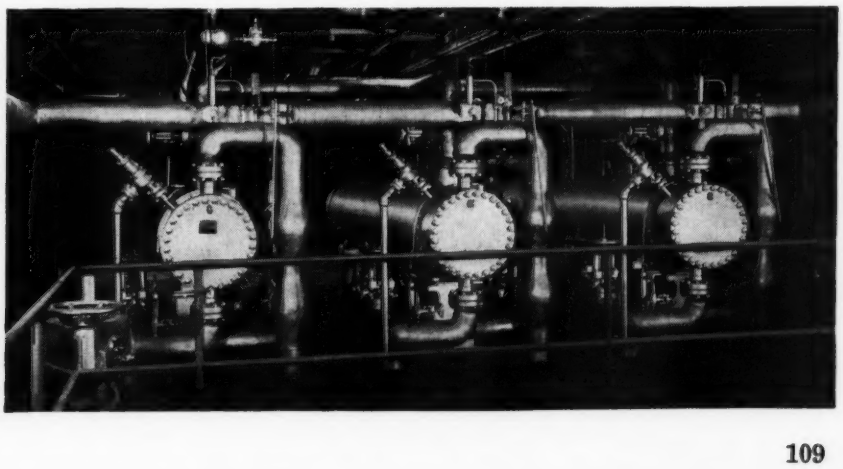


purpose room. $400,000. Client, Board of Education, Doylestown, Ohio.

Eiselt & Eiselt, Architects. Fraternity Chapter House. $175,000. Client, Alpha Mu Chapter of Tau Kappa Epsilon, Delaware, Ohio.

OREGON

Roy W. Preston, Electrical Engineer. Corvallis Junior High School, Corvallis, Ore., electrical design. $780,000. Client, Annand, Boone & Lei, Arch.

Park Rose Elementary School, electrical design, Portland, Ore. $425,000. Client, Annand, Boone & Lei.

Selling Building, Portland, Ore., electrical rehabilitation and power for central air conditioning. $40,000. Client, Norris, Beggs & Simpson, Building Mgr.

PENNSYLVANIA

Ballinger-Meserole Co. New warehouse about 20 miles from Pittsburgh, Pa. to occupy between 60,000 and 80,000 sq ft. Client, French-Fox Co., Charleroi, Pa.

Peter A. Loftus Co. Addition to air conditioning and automatic traffic-controlled elevators to 34-story office building, Pittsburgh, Pa. Client, Koppers Company, Inc.

Walker-Yeomans Associates, Inc. One-story, air conditioned, research and engineering building, building No. 3 of series, Swedesford Road, Chester County, Pa. $50,000 (est.) Client, Burroughs Corp.

William E. Sees, Jr. Sanitary sewerage system, sewage treatment plant, lift station, and appurtenances for Borough of East Berlin, Adams County, Pa. $270,000. Client, East Berlin Municipal Authority.

SOUTH CAROLINA

Lockwood Greene Engineers, Inc. Velvet carpet plant at Landrum, S. C., with 243,000 sq ft. Office and manufacturing departments air conditioned. Client, Bigelow-Sanford Carpet Co.

VIRGINIA

Lutz & Scheible. 500-man BOQ, academic building, heating plant. High temperature hot water distribution system, air conditioned academic building. Quantico, Va. $3,500,000. Client, U. S. Marine Corps.

100-man galley, Quantico, Va. $75,000. Client, U. S. Marine Corps.

WEST VIRGINIA

Jacob Feld. 140 ft radio astronomy telescope, West Virginia. Complete design. $3,000,000. Client, Associated Universities, Inc.

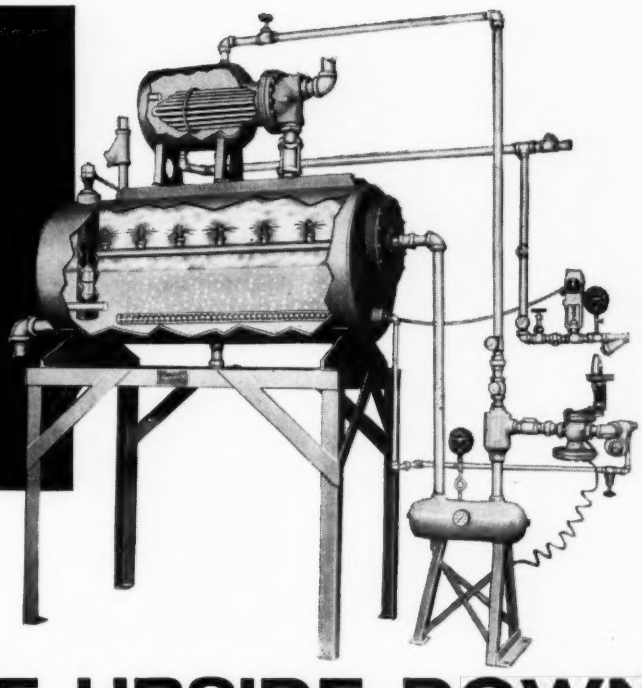
WYOMING

Harold Hoskins & Associates. Curb, gutter, paving, and storm sewers. $750,000. Client, City of Riverton, Wyo.

Water treatment plant and distribution mains. $125,000. Client, City of Saratoga, Wyo.

SCHAUB

ZERO-OXYGEN DEAERATOR



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By delivering *superheated* water into the fully vented tank, the hitherto critical problem of "matching" temperature to the *"full"* boiling point at the pressure within the deaerator is entirely eliminated. (This has been a major stumbling block with conventional deaerator design.) Passing through multiple, specially designed spray nozzles, incoming water "flashes down" in an explosive action that effectively liberates oxygen, CO_2 and all other non-condensible gases.

Also with unrestricted venting there is no need for premium-cost pressure shell. No pressure relief valve, overflow trap or orifice adjustment is ever required. Rust-proof Chromosoid lining insures extra-long life.

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DESIGN OF PIPING SYSTEMS, 2nd Ed., by the M. W. Kellogg Company; John Wiley & Sons, Inc.; 365 pp.; $15.00.

Reviewed by Woodrow W. Ramsey Ramsey and Reeves

Because this is the second edition, the subject matter naturally is enlarged to compensate for the increased complexity of the factors involved due to higher temperatures and pressures confronting the engineer today. Procedures for specific design of complete piping systems and individual components are explained very adequately. Essential background information, which is required for understanding analytical results and problems, is given.

Physics of solids, evaluation of stresses, and local components of piping are covered in the first part of the book. Simplified methods of flexibility analysis are presented as a fast check on an initial design. They may also be used for final design of non-critical systems. The Kellogg general analytical method, which gives a high degree of accuracy for a design of the most complicated critical piping system, is explained in 83 pages. Derivations of the formulas of this system are given in an appendix.

The major cost of some projects is piping, and accurate computations are necessary to keep the final cost at a minimum. The use of the Kellogg general analytical method is justified for these critical designs because of its accuracy, even though it is more time consuming than the simplified methods. There are ways of reducing the time and at the same time reducing the number of computational errors. The text shows actual problems solved by using suitable forms for recording computations. These forms aid the recording of necessary data. The actual time spent on calculations may be reduced by using digital calculator machines and automatic computers. Model testing (covered in text) is another method that can be used to lessen time spent on design of critical piping.

Although the entire subject of piping would be difficult to confine to one book, this volume is unique in covering the structural phase of piping design so completely. Future editions must, of course, be forthcoming as critical piping design is a relatively new engineering field. This book should be in the hands of every piping engineer.

FILMS

"THE MAN WITH THE TROWEL," The Master Builders Co., 16 mm, sound and color, 30 minutes.

This film discusses the problems of concrete quality control caused by variables in materials and conditions. It demonstrates the need for controlling these variables to obtain hour by hour uniformity of good concrete, and shows how Pozzolith is being employed to accomplish this result.

"DATA AND DECISION: USING ELECTRONIC COMPUTERS IN BUSINESS," American Management Association, four 35 mm, color and sound films.

This is a set of training films on electronic processing that covers the complete field — evolution, definition, machine function, methods and applications, effect on personnel policy and company planning, and future developments. ▲▲

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even an insurance company must buy insurance

Helicopter view of Prudential's new Chicago office building

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General Contractor: Geo. A. Fuller Co.
Plumbing, Sprinkler & Fire Protection: M. J. Carboy Corp., Chicago

Peerless Type TU and TUT approved fire pumps installed in Prudential's new Chicago office building

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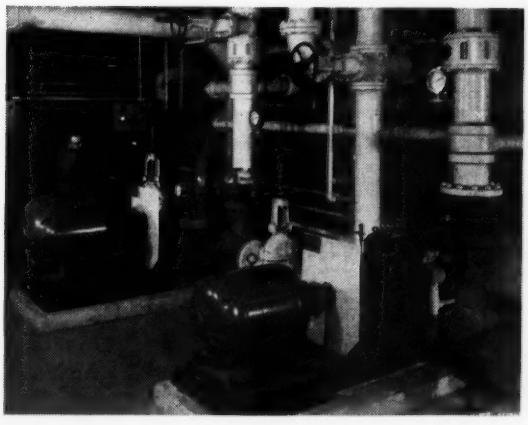

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CNE

consulting engineers' calendar

Date	Sponsor	Event	Location
July 6-8	National Federation of Associations of Consulting Engineers	Meeting to Ratify Constitution and By-laws	Mayo Hotel Tulsa, Okla.
Sept. 5	American Institute of Consulting Engineers	Monthly Meeting	Engineers' Club New York, N.Y.
Sept. 7	Midwest Research Institute	Problems and Opportunities for the Medium-Size City	Linda Hall Library of Science and Technology Kansas City, Mo.
Sept. 9-12	American Institute of Chemical Engineers	Meeting	Wm. Penn Hotel Pittsburgh, Pa.
Sept. 16-22	American Society for Testing Materials	2nd Pacific Area National Meeting and Apparatus Exhibit	Hotel Statler Los Angeles, Calif.
Sept. 17-21	Instrument Society of America	11th Annual Instrument-Automation Conference and Exhibit	N. Y. C. Coliseum New York, N.Y.
Sept. 24-28	Atomic Industrial Forum, Inc.	2nd Annual Trade Fair of the Atomic Industry & Meeting	Morrison Hotel Chicago, Ill.
Oct. 1-3	National Electronics Conference	12th Annual Conference	Hotel Sherman Chicago, Ill.
Oct. 9-10	Armour Research Foundation of Illinois Institute of Technology	Conference on Computer Applications	IIT Campus Chicago, Ill.
Oct. 11-12	Armour Research Foundation of Illinois Institute of Technology	National Noise Abatement Symposium	Hotel Sherman Chicago, Ill.
Oct. 18-19	Institute of Management Sciences	3rd Annual International Meeting	Hotel Statler Los Angeles, Calif.
Oct. 22-24	American Standards Association	38th Annual Meeting	Hotel Roosevelt New York, N.Y.
Oct. 22-26	National Safety Council	44th National Safety Congress and Exposition	Hotels Conrad Hilton, Congress, Morrison, LaSalle Chicago, Ill.

PROFESSIONAL LISTINGS